



NASA SP-7041 (04)

# EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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ISSUE 4

AUGUST 1975

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

## **PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES**

Remote Sensing of Earth Resources (NASA SP-7036(01))

Earth Resources (NASA SP-7041(01))

Earth Resources (NASA SP-7041(02))

Earth Resources (NASA SP-7041(03))

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# EARTH RESOURCES

## A Continuing Bibliography

### With Indexes

#### Issue 4

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between October 1974 and December 1974 in:

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*



*Scientific and Technical Information Office*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AUGUST 1975  
Washington, D.C.

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# INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 651 reports, articles, and other documents announced between October and December 1974 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

- IAA* entries identified by accession number series A74-10,000 in ascending accession number order.

- STAR* entries identified by accession number series N74-10,000 in ascending accession number order;

After the abstract section, there are five indexes:

- subject, personal author, corporate source, contract number and report/accession number.

# AVAILABILITY OF CITED PUBLICATIONS

## **IAA ACCESSIONS (A74-10000 Series)**

Publications announced in *IAA*, that are cited in this publication, are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA) as follows:

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Avail: ERDA Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Energy Research and Development Administration reports, usually in microfiche form, are listed in *Nuclear Science Abstracts*. Services available from the ERDA and its depositories are described in a booklet, *Science Information Available from the Energy Research and Development Administration* (TID-4550), which may be obtained without charge from the ERDA Technical Information Center.

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## Subject Categories

*Abstracts in the bibliography are grouped under the following categories:*

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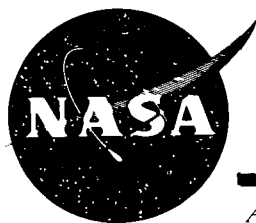
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## TYPICAL CITATION AND ABSTRACT FROM STAR

<p><b>NASA SPONSORED DOCUMENT</b></p> <p><b>NASA ACCESSION NUMBER</b></p> <p><b>TITLE</b></p> <p><b>CONTRACT OR GRANT</b></p> <p><b>REPORT NUMBER</b></p>	<p><b>N74-11185*#</b> Agricultural Research Service, Weslaco, Tex.</p> <p><b>REFLECTANCE OF VEGETATION, SOIL, AND WATER</b></p> <p>Progress Report, 19 Aug. - 19 Oct. 1973</p> <p>Craig L. Wiegand, Principal Investigator 5 Nov. 1973 7 p</p> <p>ERTS</p> <p>(NASA Order S-70251-AG)</p> <p>(E74-10044; NASA-CR-135885; PR-5) Avail: NTIS HC \$3.00 CSCL 20F</p> <p>The author has identified the following significant results. A study was conducted in a 340-acre (139 hectares) field of grain sorghum (<i>Sorghum bicolor</i> (L.) Moench) to determine if multispectral data from ERTS-1 could be used to detect differences in chlorophyll concentration between iron-deficient (chlorotic) and apparently normal (green) grain sorghum. Chlorotic sorghum areas 2.8 acres (1.1 hectares) or larger in size were identified on a computer printout of band 5 data which contains the chlorophyll absorption band at the 0.65 micron wavelength. ERTS resolution is sufficient for practical applications in detecting iron-deficient sorghum in otherwise uniform fields. The first classification map of the study county has been produced. Vegetation (crops), rangeland, bare soil, water, and an undefined (all other) category occupied 15.2, 45.0, 19.1, 0.02, and 20.6% of the land area, respectively.</p>	<p><b>AVAILABLE ON MICROFICHE</b></p> <p><b>CORPORATE SOURCE</b></p> <p><b>PUBLICATION DATE</b></p> <p><b>AVAILABILITY SOURCE</b></p>
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## TYPICAL CITATION AND ABSTRACT FROM /AA

<p><b>NASA SPONSORED DOCUMENT</b></p> <p><b>AIAA ACCESSION NUMBER</b></p> <p><b>AUTHORS</b></p> <p><b>CONTRACT OR GRANT</b></p>	<p><b>A74-14019 * #</b></p> <p><b>Detection of particulate air pollution plumes from major point sources using ERTS-1 imagery.</b> W. A. Lyons and S. R. Pease (Wisconsin, University, Milwaukee, Wis.). <i>American Meteorological Society, Bulletin</i>, vol. 54, Nov. 1973, p. 1163-1170. 14 refs. Research supported by the State of Wisconsin Department of Natural Resources. U.S. Environmental Protection Agency Grant No. R-800873; Contract No. NAS5-21736.</p> <p>The Earth Resources Technology Satellite (ERTS-1) launched by NASA in July 1972 has been providing thousands of high resolution multispectral images of interest to geographers, cartographers, hydrologists, and agrocluturists. It has been found possible to detect the long-range (over 50 km) transport of suspected particulate plumes from the Chicago-Gary steel mill complex over Lake Michigan. The observed plumes are readily related to known steel mills, a cement plant, refineries, and fossil-fuel power plants. This has important ramifications when discussing the interregional transport of atmospheric pollutants. Analysis reveals that the Multispectral Scanner Band 5 (0.6 to 0.7 micrometer) provides the best overall contrast between the smoke and the underlying water surface.</p> <p style="text-align: right;">F.R.L.</p>	<p><b>AVAILABLE ON MICROFICHE</b></p> <p><b>TITLE</b></p> <p><b>AUTHOR'S AFFILIATION</b></p> <p><b>PUBLICATION DATE</b></p>
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# EARTH RESOURCES

*A Continuing Bibliography (Issue 4)*

AUGUST 1975

01

## AGRICULTURE AND FORESTRY

Includes crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

**A74-38636** Corn aphid infestation computer analyzed from aerial color-IR. H. R. Jackson, V. R. Wallen, D. Galway, and S. W. MacDiarmid (Department of Agriculture, Ottawa, Canada). *Photogrammetric Engineering*, vol. 40, Aug. 1974, p. 943-952.

An automatic technique for the computer assessment of corn aphid infestation by comparing images of healthy and infested corn after preparation through a series of photographic and scanning procedures is outlined and discussed. Panels of healthy and infested cornfields were selected for enhancement whereby density ranges of the cyan layer were compressed to a high-contrast mode. The panels were scanned and the information recorded on magnetic tape and on the computer was analyzed. Infestation levels in the ten selected fields (or portions of them) that were analyzed varied from 10% to over 68%.  
F.R.L.

**A74-38637** Tests of an airborne tilt-indicator. U. Nielsen (Canadian Forestry Service, Ottawa, Canada). *Photogrammetric Engineering*, vol. 40, Aug. 1974, p. 953-956, 6 refs.

The effect of longitudinal tilt upon the determination of tree heights is summarized, and test results of the Airborne Data Logger (ADL-1) are given. Distortions of parallax and photographic base caused by tilt introduce significant errors. Longitudinal tilt was measured to an accuracy of plus or minus 0.3 deg 95% of the time. It is concluded that for photogrammetric values typically used in large-scale aerial photography applied in forest inventories, this accuracy is satisfactory.  
F.R.L.

**A74-38638** Airphoto measurements of New Zealand pines. T. E. Avery (Northern Arizona University, Flagstaff, Ariz.) and J. Canning (New Zealand Forest Service, Rotorua, New Zealand). *Photogrammetric Engineering*, vol. 40, Aug. 1974, p. 957-959.

Panchromatic and color aerial photographs at a scale of 1:3,000 were obtained for thinned strands of *Pinus radiata* near Rotorua, New Zealand. With color transparencies, neophyte interpreters were able to make acceptable stem counts, measure tree heights within plus or minus 5 feet, and crown diameters within plus or minus 2 feet.  
(Author)

**A74-39281 #** The application of observations made by ERTS 1 to the management of agricultural, forest and rangeland resources. C. E. Poulton (Oregon State University, Corvallis, Ore.; Earth Satellite Corp., Berkeley, Calif.). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973.

Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 275-281, 9 refs.

**A74-39706** Using ERTS-1 data systems to predict wheat disease severities and to estimate crop growth. E. T. Kanemasu (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 32D-1 to 32D-3, 6 refs.

In Kansas, wheat production is primarily affected by drought, insects, and disease; the most important wheat diseases are cereal viruses and cereal rusts. Successfully predicting disease losses for a large area would require continuous gathering of meteorological data on several fields with routine instrumentation, which would require an enormous maintenance capability. However, the Earth Resources Technology Satellite-1 (ERTS-1), launched July 23, 1972, collects data from ground-based transmitters in remote areas and transmits the data of one of three prime receiving stations: Goldstone, Calif., NASA Test and Training Facility, and Fairbanks, Alaska. The satellite's data collecting capability offers a unique opportunity to test and evaluate data collection platforms to predict epidemics of wheat diseases.  
F.R.L.

**A74-39707** Applications of ERTS multispectral imagery to agricultural research. W. W. Knapp, B. E. Dethier (New York State College of Agriculture and Life Sciences, Ithaca, N.Y.), and M. D. Ashley (Maine, University, Orono, Me.). In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 32E-1 to 32E-6.

A study of vegetative development and senescence of forest, rangeland, and agricultural field crops throughout the United States using ERTS-1 Multispectral Scanner (MSS) data is described. Satellite radiance measurements in the 400-1100 nm wavelength interval have been correlated with coincident ground truth observations from twenty-four test sites to yield interpretive techniques for identifying and mapping seasonal vegetation changes in several plant species from the MSS observations. Digital and sensitometric data processing techniques are outlined and results illustrated.  
(Author)

**A74-40381** Spectra of radar signals reflected from forests at centimeter waves. V. A. Kapitanov, Iu. V. Mel'nikhuk, and A. A. Chernikov. (*Radiotekhnika i Elektronika*, vol. 18, Sept. 1973.) *Radio Engineering and Electronic Physics*, vol. 18, Sept. 1973, p. 1330-1338, 5 refs. Translation.

The spectra of radar signals from forest regions at small grazing angles at a wavelength of 3.2 cm are investigated experimentally. The equipment ensured the measurement of the spectral densities up to -40 dB from the maximum. Up to spectral densities of -10 to -15 dB, the form of the spectrum is close to Gaussian; further decrease of the spectral density is described by a power law with the power exponent of about -4. A model of the formation of the spectra of radar signals from forests is proposed. A comparison of the measured and computed parameters of the spectra of radar signals yielded satisfactory results. The measurements of the spectra of orthogonally polarized components of the reflected signals during the radiation of waves of different polarization also agrees with the developed model.  
(Author)

## 01 AGRICULTURE AND FORESTRY

**A74-40486 \* #** **RPVs - Exploring civilian applications.** T. J. Gregory, R. O. Bailey, and W. P. Nelms (NASA, Ames Research Center, Moffett Field, Calif.). *Astronautics and Aeronautics*, vol. 12, Sept. 1974, p. 38-47. 15 refs.

Discussion of the civilian application possibilities for remotely piloted vehicle (RPV) systems. Following a listing of all possible desert, coastal, forest, agricultural, and urban RPV missions, a thorough examination is presented of such possible RPV aircraft applications as those of forest-fire detection and mapping. Some of the major obstacles to such civilian missions are also reviewed.

M.V.E.

**A74-41116 \*** **ERTS-1 data collection systems used to predict wheat disease severities.** E. T. Kanemasu, H. Schimmelpfennig, E. Chin Choy, M. G. Eversmeyer, and D. Lenhart (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Remote Sensing of Environment*, vol. 3, no. 2, 1974, p. 93-97. NASA-supported research.

The feasibility of using the data collection system on Earth Technology Satellite-1 to predict wheat leaf rust severity and resulting yield loss was tested. Ground-based data-collection platforms (DCPs), placed in two commercial wheat fields, transmitted to the satellite such meteorological information as maximum and minimum temperature, relative humidity, and hours of free moisture. Meteorological data received from the two DCPs from April 23 to 29 were used to estimate the disease progress curve. Values from the curve were used to predict the percentage decrease in wheat yields resulting from leaf rust. Actual decrease in yield obtained by applying a zinc and maneb spray to control leaf rust, and then comparing yields of the controlled (healthy) and the noncontrolled (rusty) areas. In each field, a 9% decrease in yield was predicted by the DCP-derived data; actual decreases were 12% and 9%. (Author)

**A74-41117 \*** **Remote sensing of algal blooms by aircraft and satellite in Lake Erie and Utah Lake.** A. E. Strong (NOAA, National Environmental Satellite Service, Hillcrest Heights, Md.). *Remote Sensing of Environment*, vol. 3, no. 2, 1974, p. 99-107. 8 refs. NASA Order S-70246-AG.

During late summer, when the surface waters of Lake Erie reach their maximum temperature, an algal bloom is likely to develop. Such phenomena, which characterize eutrophic conditions, have been noticed on other shallow lakes using the Earth Resources Technology Satellite (ERTS-1). The concentration of the algae into long streamers provides additional information on surface circulations. To augment the ERTS Multispectral Scanner Subsystem data of Lake Erie, an aircraft was used to obtain correlative thermal-IR and additional multiband photographs. A large bloom of *Aphanizomenon flos-aquae* observed in Utah Lake together with recent bloom history in Lake Erie is used to verify the Great Lakes bloom. (Author)

**A74-41118 \*** **Statistical separability of spectral classes of blighted corn.** R. Kumar and L. Silva (Purdue University, West Lafayette, Ind.). *Remote Sensing of Environment*, vol. 3, no. 2, 1974, p. 109-115. 7 refs. Grant No. NGL-15-005-112.

A study was conducted to determine the statistical separability of multispectral measurements from corn having varying levels of southern corn leaf blight severity. Multispectral scanner data in twelve spectral channels in the wavelength range 0.4 to 11.7 microns were analyzed for ten selected flightlines of the 1971 Corn Blight Watch Experiment. A total of 168 corn fields having 18,804 sample points were analyzed. The blight rating information for these fields was available from ground observations. Maximum average transformed divergence between spectral classes of all possible pairs of blight levels, maximized over a subset of channels, was computed in each of one, two, three, and four spectral channels for each of ten flightlines. From the statistical analysis of the values of average

transformed divergence, it was concluded that the greater the difference between the blight levels, the more statistically separable they are. (Author)

**A74-42811** **Coastal vegetation surveys.** J. C. E. Hubbard (City University, London, England) and B. H. Grimes (Nature Conservancy, London, England). In: *Environmental remote sensing: Applications and achievements; Proceedings of the Symposium*, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 127-141. 9 refs.

Aerial photography has proved to be a fruitful means of documenting and analyzing vegetation in coastal zones. This paper reports some of the recent successes achieved through the investigation of coastal patterns recorded in both the visible and non-visible portions of the electromagnetic spectrum. Drawing examples from the coasts of southern Britain, France and Spain, it deals in turn with the vegetation of mudflats, salt-marshes, shingle beaches, sand-dunes and cliffs. Few such habitats lend themselves to easy mapping on the ground, owing to such factors as inaccessibility, the tidal cycle, and the instability of certain surfaces. (Author)

**A74-42812** **Use of satellites and radar in locust control.** D. E. Pedgley (Overseas Development Administration, Centre for Overseas Pest Research, London, England). In: *Environmental remote sensing: Applications and achievements; Proceedings of the Symposium*, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 143-152. 8 refs.

After outlining the population dynamics of the Desert Locust, the current use of meteorological satellites in helping to locate cloud systems that can give rains sufficient for breeding is discussed. An experiment is described in which the first Earth Resources Technology Satellite is to be used to test the feasibility of directly locating potential breeding sites, i.e., ground that has been wetted by such rains, and where vegetation is becoming greener. Studies are mentioned in which radar has been used to examine the flight of solitary locusts and to locate wind systems near which flying populations are likely to be concentrated. Some possible lines for future development are given. (Author)

**A74-42813** **Remote sensing for the identification of crops and crop diseases.** T. S. Bell (Ministry of Agriculture, Fisheries, and Food, Cambridge, England). In: *Environmental remote sensing: Applications and achievements; Proceedings of the Symposium*, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 153-166. 6 refs.

Crop patterns are recorded in aerial photographs as changes in tone or color, and hence one of the main problems is the choice of film/filter combinations that will best record them. Aerial color films have rarely provided more information that is available on aerial panchromatic film, but they are often easier to interpret. Color infra-red film is said to be the most revealing single film for crop studies, but there has been insufficient experience with this emulsion to draw firm conclusions. Crop identification is discussed, as well as crop diseases (airborne, seed-borne, and soil-borne diseases). Quantitative assessment of crops and diseases are made. F.R.L.

**A74-42864 #** **Side-looking radar systems and their potential application to earth-resources surveys. II - Earth-science applications.** R. A. G. Saviegar, J. R. Hardy, E. H. Roberts (Reading University, Reading, Berks., England), N. R. Cox (Easams, Ltd., Camberley, Surrey, England), J. F. Hughes (Commonwealth Forestry Institute, Oxford, England), and J. W. Norman (Imperial College of Science



and Technology, London, England). *Revue Scientifique et Technique CECLES/CERS*, vol. 6, Apr.-June 1974, p. 137-159. 102 refs.

**A74-43149** ERTS data tested for forestry applications. G. R. Heath. *Photogrammetric Engineering*, vol. 40, Sept. 1974, p. 1087-1091.

The author led a NASA team of investigators determining the value of ERTS data to foresters. Tests showed that 14 timber types and land-use patterns of interest to foresters could be classified within reasonable accuracy limits. Computer methods were found to be better than conventional imagery interpretation methods in making these classifications. In addition it was learned that insect and fire damage could be detected in this data. Future satellite systems of this type hold a promise of real-time continuous inventories and many types of temporal studies, which will greatly improve management capabilities. (Author)

**N74-29697\*** Clemson Univ., S.C. Dept. of Horticulture. **CROP STATUS EVALUATIONS AND YIELD PREDICTIONS** Monthly Progress Report, 1 May - 1 Jun. 1974

J. R. Haun, Principal Investigator 6 Jun. 1974 7 p EREP (Contract NAS9-14006) (E74-10666; NASA-CR-138996) Avail: NTIS HC \$4.00 CSCL 02C

**N74-29698\*** Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif. **INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS** Bimonthly Progress Report, 16 May - 16 Jul. 1974

Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 22 Jul. 1974 9 p EREP (NASA Order T-4106-B) (E74-10668; NASA-CR-139240; BMPR-12) Avail: NTIS HC \$4.00 CSCL 02F

**N74-29699\*** Army Cold Regions Research and Engineering Lab., Hanover, N.H.

**NEW ENGLAND RESERVOIR MANAGEMENT: LAND USE/VEGETATION MAPPING IN RESERVOIR MANAGEMENT (MERRIMACK RIVER BASIN)** Interim Contract Report

Saul Cooper, Principal Investigator, Harlan L. McKim, Lawrence W. Gatto, Carolyn J. Merry, Duwayne M. Anderson, and Thomas L. Marlar 14 Jun. 1974 30 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(NASA Order T-4646-B) (E74-10669; NASA-CR-139239) Avail: NTIS HC \$4.50 CSCL 08B

The author has identified the following significant results. It is evident from this comparison that for land use/vegetation mapping the S190B Skylab photography compares favorably with the RB-57 photography and is much superior to the ERTS-1 and Skylab 190A imagery. For most purposes the 12.5 meter resolution of the S190B imagery is sufficient to permit extraction of the information required for rapid land use and vegetation surveys necessary in the management of reservoir or watershed. The ERTS-1 and S190A data products are not considered adequate for this purpose, although they are useful for rapid regional surveys at the level 1 category of the land use/vegetation classification system.

**N74-29700\*** South Dakota State Univ., Brookings. Remote Sensing Inst.

**[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL]** Monthly Progress Report, Jun. 1974

Victor I. Myers, Principal Investigator 20 Jul. 1974 2 p EREP (Contract NAS9-13337) (E74-10670; NASA-CR-139238) Avail: NTIS HC \$4.00 CSCL 05B

**N74-29702\*** Northern Prairie Wildlife Research Center, Jamestown, N. Dak.

**UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT** Monthly Progress Report, Jul. 1974

Harvey K. Nelson, Principal Investigator Jul. 1974 2 p EREP (NASA Order T-4114-B) (E74-10673; NASA-CR-138967) Avail: NTIS HC \$4.00 CSCL 06C

**N74-30668\*** Texas A&M Univ., College Station. Remote Sensing Center.

**MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION** Progress Report, 28 Mar. - 27 May 1974

J. W. Rouse, Jr., Principal Investigator 27 May 1974 8 p ERTS (Contract NAS5-21857) (E74-10676; NASA-CR-139243; PR-7) Avail: NTIS HC \$4.00 CSCL 08F

The author has identified the following significant results. From the data that have been analyzed thus far, it is apparent that certain parameters of the vegetation (green biomass and vegetation moisture content) are well correlated with ERTS data at some sites, yet the relationship is poor at other locations. The analyses indicate that the green wave development (spring) can be readily detected in the Great Plains Corridor. Consequently, ERTS-1 data provide a new tool for monitoring range readiness on a regional basis. The onset of summer drought and its duration can also be monitored. Data from ten G.P.C. sites suggest that the satellite coverage has been adequate to monitor the status of rangeland vegetation for regional management purposes.

**N74-30681\*** American Univ., Washington, D.C. Dept. of Biology.

**SKYLAB - EREP INVESTIGATIONS OF WETLANDS ECOLOGY** Bimonthly Progress Report, 6 Jun. - 6 Aug. 1974

Richard R. Anderson, Virginia P. Carter, Principal Investigators, and Linda J. Alsied 6 Aug. 1974 4 p EREP

(Contract NAS1-12209) (E74-10691; NASA-CR-139224; BMPR-8) Avail: NTIS HC \$4.00 CSCL 08H

**N74-30692\*** Iowa State Univ. of Science and Technology, Ames. Agriculture Experiment Station.

**REMOTE SENSING IN IOWA AGRICULTURE: IDENTIFICATION AND CLASSIFICATION OF IOWA'S CROPS, SOILS AND FORESTRY RESOURCES USING ERTS-1 AND COMPLIMENTARY UNDERFLIGHT IMAGERY** Final Report, period ending May 1974

J. P. Mahlstede, Principal Investigator, A. Epstein, R. E. Carlson,

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T. E. Fenton, and G. W. Thomson 28 May 1974 71 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21839) (E74-10703; NASA-CR-139323) Avail: NTIS HC \$6.75 CSCI 02C

**N74-30698** Ludwig-Maximilians-Universitat, Munich (West Germany).

**ANOMALIES OF THE VERTICAL Z COMPONENT IN THE EARTH MAGNETIC FIELD OF THE BEGINNING NORTHERN ALPS AND IN THE EASTERN ALPS, MEASURED ALONG THE PROFILES 1965-1973 (PROFILE SYNOPSIS) [ANOMALIEN DER VERTIKALEN KOMPONENTE Z DES ERDMAGNETFELDES IM NOERDLICHEN ALPEN-VORLAND UND IN DEN OSTALPEN, GEMESSEN LAENGSTENS PROFILEN 1965-1973 (PROFILMONTAGE)]**

G. Angenheister In *its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 15-36 refs In GERMAN

Precise geomagnetic anomaly measurements for the Berchtesgaden area are presented in maps, and various geomorphological models for the earth crust structure are used to interpret variations in magnetic values. Transl. by G.G.

**N74-30700** Tohoku Univ., Sendai (Japan). Dept. of Earth Science.

**RESULTS OF AEROMAGNETIC SURVEYS OVER SOME VOLCANOES AND CALDERAS IN JAPAN**

Isao Muroi In Tohoku Univ. Sci. Rept. Ser. 5: Geophys Vol. 21, No. 3 Sep. 1973 p 87-111 refs

Aeromagnetic surveys of the total intensity over Oshima and Hakone volcanoes, and Towada and Onikobe calderas in Japan were carried out at different flight levels by using a proton precession magnetometer mounted on a helicopter, in order to study their magnetic structures. The magnetic anomaly to be measured at each height depends on the magnetic contrast of the underground structure. The rate at which the anomaly varies with the flight level is affected by the shape of the structure. From the vertical gradient of the total magnetic anomaly, the depth and shape of the structure have been determined. In Oshima, the anomaly is considerable and the structures are very complicated with several dipole models, the depth ranging from 800 m to 4 km. In Hakone, the anomaly due to the Old Somma lava is obvious. 'Kintokiyama - Maku-yama' dislocation line is made clear. Two prism-shaped models as the assumed structure for Mt. Kamiyama are considered at 0.5 and 1.0 km in depth. In the Towada district, a large low anomaly over the northeastern shore of the Lake Towada and two anomalies over Yasumiya south of the Lake were observed. The former is assumed to be a dipole with a reversed magnetization situated at 4 km in depth. In Onikobe, a caldera-like feature is shown, though the magnetic anomaly is not so considerable as the areas mentioned above. Author

**N74-30708\*** Kansas Univ., Lawrence. Dept. of Geography. **ESTIMATE OF WINTER WHEAT YIELD FROM ERTS-1**

Stanley A. Morain and Donald W. Williams In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 21-28 refs

(Paper-A1) CSCI 02C

A model for estimating wheat yield per acre has been applied to acreage estimates derived from ERTS-1 imagery to project the 1973 wheat yields for a ten county area in southwest Kansas. The results (41.04 million bushels) are within 3 per cent of the

preharvest estimates for the same area prepared by the USDA Statistical Reporting Service (39.91 million bushels). The projection from ERTS data is based on a visual enumeration of all detectable wheat fields in the study area and was completed while the harvest was in progress. Visual identification of winter wheat is readily achieved by using a temporal sequence of images (band 5 for Sept.-Oct.; band 5 for Dec.-Jan.; and band 5 and 7 for March-April). Identification can be improved by stratifying the project area into subregions having more or less homogeneous agricultural practices and crop mixes. By doing this, small changes in the spectral appearance of wheat related to soil type, irrigation, etc. can be accounted for. The interpretation rules developed by visual analysis can be automated for rapid computer surveys. Author

**N74-30709\*** Canadian Center for Remote Sensing, Ottawa (Ontario).

**USER ORIENTED ERTS-1 IMAGES**

Seymour Shlien and David Goodenough In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 29-40 refs (Paper-A2) CSCI 14B

Photographic reproduction of ERTS-1 images are capable of displaying only a portion of the total information available from the multispectral scanner. Methods are being developed to generate ERTS-1 images oriented towards special users such as agriculturists, foresters, and hydrologists by applying image enhancement techniques and interactive statistical classification schemes. Spatial boundaries and linear features can be emphasized and delineated using simple filters. Linear and nonlinear transformations can be applied to the spectral data to emphasize certain ground information. An automatic classification scheme was developed to identify particular ground cover classes such as fallow, grain, rape seed or various vegetation covers. The scheme applies the maximum likelihood decision rule to the spectral information and classifies the ERTS-1 image on a pixel by pixel basis. Preliminary results indicate that the classifier has limited success in distinguishing crops, but is well adapted for identifying different types of vegetation. Author

**N74-30711\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**THE UTILITY OF ERTS-1 DATA FOR APPLICATIONS IN AGRICULTURE AND FORESTRY**

R. Bryan Erb In *its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 75-85

(Paper-A4) CSCI 02F

A comprehensive study has been undertaken to determine the extent to which ERTS-1 data could be used to detect, identify (classify), locate and measure features of applications interest in the disciplines of agriculture and forestry. The study areas included: six counties in five states in which were located examples of the most important crops and practices of American agriculture; and a portion of the Sam Houston National Forest, a typical Gulf coastal plain pine forest. The investigation utilized conventional image interpretation and computer-aided (spectral pattern recognition) analysis using both image products and computer compatible tapes. The emphasis was generally upon the computer-aided techniques. It was concluded that ERTS-1 data can be used to detect, identify, locate and measure a wide array of features of interest in agriculture and forestry. Author

**N74-30712\*** Department of Agriculture, Washington, D.C. Statistical Reporting Service.

**CROP IDENTIFICATION AND ACREAGE MEASUREMENT UTILIZING ERTS IMAGERY**

William H. Wigton and Donald H. VonSteen In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 87-92

(Paper-A5) CSCI 02C

The Statistical Reporting Service of the U.S. Department of Agriculture is evaluating ERTS-1 imagery as a potential tool for

estimating crop acreage. A main data source for the estimates is obtained by enumerating small land parcels that have been randomly selected from the total U.S. land area. These small parcels are being used as ground observations in this investigation. The test sites are located in Missouri, Kansas, Idaho, and South Dakota. The major crops of interest are wheat, cotton, corn, soybeans, sugar beets, potatoes, oats, alfalfa, and grain sorghum. Some of the crops are unique to a given site while others are common in two or three states. This provides an opportunity to observe crops grown under different conditions. Results for the Missouri test site are presented. Results of temporal overlays, unequal prior probabilities, and sample classifiers are discussed. The amount of improvement that each technique contributes is shown in terms of overall performance. The results show that useful information for making crop acreage estimates can be obtained from ERTS-1 data. Author

**N74-30713\*** Agricultural Research Service, Weslaco, Tex.  
**VEGETATION DENSITY AS DEDUCED FROM ERTS-1 MSS RESPONSE**

C. L. Wiegand, H. W. Gausman, J. A. Cuellar, A. H. Gerbermann, and A. J. Richardson /*In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 93-116 refs*

(Paper-A6) CSCL 08F

Reflectance from vegetation increases with increasing vegetation density in the 0.75- to 1.35 micron wavelength interval. Therefore, ERTS-1 bands 6 (0.7 to 0.8 micron) and 7 (0.8 to 1.1 micron) contain information that should relate to the probable yield of crops and the animal carrying capacity of rangeland. The results of an experiment designed specifically to test the relations among Leaf Area Index (LAI), plant population, plant cover and plant height, and the ERTS-1 MSS responses for 3 corn, 10 sorghum, and 10 cotton fields are given. Plant population was as useful as LAI for characterizing the sorghum and corn fields, and plant height was as good as LAI for characterizing cotton fields. These findings generally support the utility of ERTS-1 data for explaining variability in green biomass, harvestable forage and other indicators of productivity. Author

**N74-30714\*** California Univ., Berkeley. Center for Remote Sensing Research.

**REGIONAL AGRICULTURE SURVEYS USING ERTS-1 DATA**

William C. Draeger, James D. Nichols, Andrew S. Benson, David G. Larrabee, William M. Jenkins, and Claire M. Hay /*In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 117-125*

(Paper-A7) CSCL 02C

The Center for Remote Sensing Research has conducted studies designed to evaluate the potential application of ERTS data in performing agricultural inventories, and to develop efficient methods of data handling and analysis useful in the operational context for performing large area surveys. This work has resulted in the development of an integrated system utilizing both human and computer analysis of ground, aerial, and space imagery, which has been shown to be very efficient for regional crop acreage inventories. The technique involves: (1) the delineation of ERTS images into relatively homogeneous strata by human interpreters, (2) the point-by-point classification of the area within each strata on the basis of crop type using a human/machine interactive digital image processing system; and (3) a multistage sampling procedure for the collection of supporting aerial and ground data used in the adjustment and verification of the classification results. Author

**N74-30715\*** Canadian Forestry Service, Edmonton (Alberta).  
**FOREST AND LAND INVENTORY USING ERTS IMAGERY AND AERIAL PHOTOGRAPHY IN THE BOREAL FOREST REGION OF ALBERTA, CANADA**

C. L. Kirby /*In NASA, Goddard Space Flight Center 3d ERTS-1*

*Symp., Vol. 1, Sect. A 1974 p 127-136*

(Paper-A8) CSCL 02F

Satellite imagery and small-scale (1:120,000) infrared *ektachrome aerial photography* for the development of improved forest and land inventory techniques in the boreal forest region are presented to demonstrate spectral signatures and their application. The forest is predominately mixed, stands of white spruce and poplar, with some pure stands of black spruce, pine and large areas of poorly drained land with peat and sedge type muskegs. This work is part of coordinated program to evaluate ERTS imagery by the Canadian Forestry Service. Author

**N74-30717\*** California Univ., Berkeley. Center for Remote Sensing Research.

**A TIMER INVENTORY BASED UPON MANUAL AND AUTOMATED ANALYSIS OF ERTS-1 AND SUPPORTING AIRCRAFT DATA USING MULTISTAGE PROBABILITY SAMPLING**

James D. Nichols, Mike Gialdini, and Sipi Jaakkola /*In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 145-157*

(Paper-A10) CSCL 02F

A quasi-operational study demonstrating that a timber inventory based on manual and automated analysis of ERTS-1, supporting aircraft data and ground data was made using multistage sampling techniques. The inventory proved to be a timely, cost effective alternative to conventional timber inventory techniques. The timber volume on the Quincy Ranger District of the Plumas National Forest was estimated to be 2.44 billion board feet with a sampling error of 8.2 percent. Costs per acre for the inventory procedure at 1.1 cent/acre compared favorably with the costs of a conventional inventory at 25 cents/acre. A point-by-point comparison of CALSCAN-classified ERTS data with human-interpreted low altitude photo plots indicated no significant differences in the overall classification accuracies. Author

**N74-30718\*** Nuclear Research Center, Athens (Greece).  
**APPLICATION OF ERTS-1 IMAGERY TO LAND USE, FOREST DENSITY AND SOIL INVESTIGATIONS IN GREECE**

N. J. Yassoglou, E. Skordalakis, and A. Koutalos /*In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 159-182 refs*

(Paper-A11) CSCL 02F

Photographic and digital imagery received from ERTS-1 was analyzed and evaluated as to its usefulness for the assessment of agricultural and forest land resources. Black and white, and color composite imagery provided spectral and spatial data, which, when matched with temporal land information, provided the basis for a semidetalled land use and forest site evaluation cartography. Color composite photographs have provided some information on the status of irrigation of agricultural lands. Computer processed digital imagery was successfully used for detailed crop classification and semidetalled soil evaluation. The results and techniques of this investigation are applicable to ecological and geological conditions similar to those prevailing in the Eastern Mediterranean. Author

**N74-30721\*** Nebraska Univ., Lincoln. Dept. of Agronomy.  
**APPLICATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA**

Paul M. Seevers, David T. Lewis, and James V. Drew /*In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 225-232*

(Paper-A14) CSCL 08B

Interpretations of imagery from the Earth Resources Technology Satellite (ERTS-1) indicate that soil associations and attendant range sites can be identified on the basis of vegetation and topography using multi-temporal imagery. Optical density

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measurements of imagery from the visible red band of the multispectral scanner (MSS band 5) obtained during the growing season were related to field measurements of vegetative biomass, a factor that closely parallels range condition class on specific range sites. ERTS-1 imagery also permitted inventory and assessment of center-pivot irrigation systems in the Sand Hills region in relation to soil and topographic conditions and energy requirements. Author

**N74-30723\*** American Univ., Washington, D.C. Dept. of Biology.

### REMOTE SENSING EXPERIMENT IN WEST AFRICA

N. H. MacLeod. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 247-266

(Paper-A16) CSCL 02C

There are substantial needs of the Sahelian Zone to detail the state of regional agricultural resources in the face of a sixth year of serious drought conditions. While most of the work has been done in the Republic of Niger, the principles which have emerged from the analysis seem to be applicable to much of the Sahel. The discussion relates to quite specific rehabilitation and development initiatives under consideration in Niger which are based in part upon direct analysis of ERTS imagery of the country, in part on field surveys and on discussions with Nigerian officials and technicians. Again, because the entire Sahelian Zone (including Niger) has large zones of similar ecologic characteristics, modifications of the approaches suggested for Niger are applicable to the solution of rehabilitation of the desert, the savannah and the woodlands of West Africa in general. Author

**N74-30724\*** Nevada Univ., Reno. Remote Sensing Lab.

### NATURAL RESOURCE INVENTORIES AND MANAGEMENT APPLICATIONS IN THE GREAT BASIN

Paul T. Tueller, Garwin Lorain, and Ronald M. Halvorson. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 267-289 refs

(Paper-A17) CSCL 08F

ERTS-1 resolution capabilities and repetitive coverage have allowed the acquisition of several statewide inventories of natural resource features not previously completed or that could not be completed in any other way. Familiarity with landform, tone, pattern and other converging factors, along with multirate imagery, has been required. Nevada's vegetation has been mapped from ERTS-1. Dynamic characteristics of the landscape have been studied. Sequential ERTS-1 imagery has proved its usefulness for mapping vegetation, following vegetation phenology changes, monitoring changes in lakes and reservoirs (including water quality), determining changes in surface mining use, making fire fuel estimates and determining potential hazard, mapping the distribution of rain and snow events, making range readiness determinations, monitoring marshland management practices and other uses. Feasibility has been determined, but details of incorporating the data in management systems awaits further research and development. The need is to accurately define the steps necessary to extract required or usable information from ERTS imagery and fit it into on-going management programs. Author

**N74-30726\*** Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).

### VEGETATION MAPPING FROM ERTS IMAGERY OF THE OKAVANGO DELTA

Douglas T. Willamson. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 301-308 refs

(Paper-A19) CSCL 08B

The Okavango is Botswana's major water resource. The present study has been specifically directed at mapping vegetation types within the delta and generally concerned with finding what

information of value to plant and animal ecologists could be extracted from the imagery. To date it has been found that: (1) It is possible to map broad vegetation types from the imagery. (2) Imagery of the delta records the state of the system in a manner which will facilitate long-term studies of plant succession. (3) Phenological events can be detected. (4) The imagery can be used to detect and map wild fires. This will be useful in determining the role of fire in the ecology of the region. Using the imagery it is thus possible to map existing vegetation and monitor both short and long-term changes. Author

**N74-30727\*** Texas A&M Univ., College Station.

### MONITORING VEGETATION SYSTEMS IN THE GREAT PLAINS WITH ERTS

J. W. Rouse, Jr., R. H. Haas, J. A. Schell, and D. W. Deering. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 309-317

(Paper-A20) CSCL 08F

The Great Plains Corridor rangeland project utilizes natural vegetation systems as phenological indicators of seasonal development and climatic effects upon regional growth conditions. A method has been developed for quantitative measurement of vegetation conditions over broad regions using ERTS-1 MSS data. Radiance values recorded in ERTS-1 spectral bands 5 and 7, corrected for sun angle, are used to compute a band ratio parameter which is shown to be correlated with aboveground green biomass on rangelands. Author

**N74-30728\*** National Research Council, Bangkok (Thailand).

### AGRICULTURAL UTILIZATION OF ERTS-1 DATA IN THAILAND

Pradisth Cheosakul, Boon Indrabarya, Joseph O. Morgan, and Suwit Vibulsresth. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 319-329

(Paper-A21) CSCL 02C

Recent advances made in three disciplinary areas that are of major importance to Thailand are briefly discussed. These areas are: (1) agriculture, (2) forestry, and (3) land use. Preliminary investigations of the ERTS-1 data have been so successful that the Thai Government has decided to develop a remote sensing data handling and research center. Author

**N74-30746\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

### PHOTOINTERPRETATION OF ERTS-A MULTISPECTRAL IMAGES ANALYSIS OF VEGETATION AND LAND USE FOR THE VALENCIA LAKE BASIN REGION

F. Salas, M. Pineda, and A. Arismendi. *In* its 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 585-593

(Paper-L18) CSCL 08B

The area of investigation includes part of the Central and Capital Region of Venezuela. Climatic conditions define the existence of different ecological associations with biological forms well defined in their physiognomic complexity as they reach complete development in environments related to gross geomorphic units: coastal area, northern mountain range, fluvio-lacustrine plains, southern mountain range, southern ridges and parts of Venezuelan central plains. In this area, rainfall varies from 600 mm to 2000 mm and evapotranspiration indexes indicate the existence of vegetation for semiarid conditions (tropical very dry forest) as well as vegetation for very humid conditions (very humid premontane forest). This project was designed for: (1) Location of areas with representative ecosystems for the purpose of managing planning. (2) Identification of structural and physiognomic characteristics of vegetation. (3) Assessment of human activity effects on environmental debasement. (4) Definition of the content and possibilities of orbital ERTS images for the study of urban and rural land use. (5) Setting photointerpretation patterns applicable to areas of similar gross environmental conditions. Author

**N74-30752\*** Geological Survey, Denver, Colo.  
**AN INVESTIGATION OF MAJOR SAND SEAS IN DESERT AREAS THROUGHOUT THE WORLD**

Edwin D. McKee and Carol S. Breed (Geological Survey, Flagstaff, Ariz.) *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 665-679

(Paper-G6) CSCL 20M

This study of sand seas on a global scale consists of identifying and measuring characteristic sand forms, examining structures, determining the processes involved, and ascertaining the world distribution of various types of sand bodies. Fifteen major areas or sites in the Eastern Hemisphere and three sites in the Western Hemisphere have been examined. In this study an attempt is made to develop a strictly objective classification of worldwide application. Ultimate objectives are threefold. First, a better understanding of stratification in ancient rocks of dune origin; such structures are important in the migration of water and oil. Second, a further insight into the controls of sand migration that in some areas adversely affects various enterprises of man may be obtained. Finally, an appreciation of certain similar patterns on Mars, apparently wind-formed, may result. Author

**N74-30753\*** Geological Survey, Menlo Park, Calif.  
**A NEW METHOD FOR MONITORING GLOBAL VOLCANIC ACTIVITY**

Peter L. Ward, Elliot Endo, David H. Harlow, Rex Allen, and Jerry P. Eaton *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 681-689

(Paper-G7) CSCL 08F

The ERTS Data Collection System makes it feasible for the first time to monitor the level of activity at widely separated volcanoes and to relay these data rapidly to one central office for analysis. While prediction of specific eruptions is still an elusive goal, early warning of a reawakening of quiescent volcanoes is now a distinct possibility. A prototypical global volcano surveillance system was established under the ERTS program. Instruments were installed in cooperation with local scientists on 15 volcanoes in Alaska, Hawaii, Washington, California, Iceland, Guatemala, El Salvador and Nicaragua. The sensors include 19 seismic event counters that count four different sizes of earthquakes and six biaxial borehole tiltmeters that measure ground tilt with a resolution of 1 microradian. Only seismic and tilt data are collected because these have been shown in the past to indicate most reliably the level of volcano activity at many different volcanoes. Furthermore, these parameters can be measured relatively easily with new instrumentation. Author

**N74-30773\*** Federal Geological Survey, Hanover (West Germany).

**PRELIMINARY RESULTS OF ERTS-INVESTIGATIONS BY W-GERMAN INVESTIGATIONS**

Richard Muehlfeld *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 969-976

(Paper-G28) CSCL 05B

Results are presented of West German investigations into multidisciplinary geoscientific experiments in central Germany and the Alps, and hydrogeological investigations in the Pampa of Argentina based on ERTS-1 data. The main goals of the investigation were achieved. The studies have given a good idea of the possibilities and limitations of ERTS imagery depending on the objectives in question and on the geographical conditions of the areas under investigation. Even in the well known region of central Europe, ERTS has proven its ability of improving present knowledge. In fields such as pollution monitoring and regional planning the satellite techniques should have distinct practical value. For any regional study of less known areas, the value of ERTS imagery can hardly be overestimated. Author

**N74-30790\*** Delaware Univ., Newark. Coll. of Marine Studies.

**INVENTORIES OF DELAWARE'S COASTAL VEGETATION AND LAND-USE UTILIZING DIGITAL PROCESSING OF ERTS-1 IMAGERY**

V. Klemas, D. Bartlett, R. Rogers (Bendix Corp., Ann Arbor), and L. Reed (Bendix Corp., Ann Arbor) *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1243-1255 refs.

(Paper-W16) CSCL 08H

Digital analysis of ERTS-1 imagery was used in an attempt to map and inventory the significant ecological communities of Delaware's coastal zone. Eight vegetation and land use discrimination classes were selected: (1) phragmites communis (Giant Reed grass); (2) spartina alterniflora (Salt marsh cord grass); (3) spartina patens (Salt marsh hay); (4) shallow water and exposed mud; (5) deep water (2 meters); (6) forest; (7) agriculture; and (8) exposed sand and concrete. Canonical analysis showed that classification accuracy was quite good with spartina alterniflora, exposed sand-concrete, and forested land - all discriminated with between 94% and 100% accuracy. The shallow water-mud and deep water categories were classified with accuracies of 88% and 93% respectively. Phragmites communis showed a classification accuracy of 83% with all confusion occurring with spartina patens which may be due to use of mixed stands of these species as training sets. Discrimination of spartina patens was very poor (accuracy 52%). Author

**N74-30813\*** Philco-Ford Corp., Philadelphia, Pa.  
**AN EVALUATION OF THE USE OF ERTS-1 SATELLITE IMAGERY FOR GRIZZLY BEAR HABITAT ANALYSIS c04**

Joel R. Varney, John J. Craighead (Mont. Univ., Missoula), and Jay S. Sumner (Mont. Univ., Missoula) *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1653-1670 refs.

(Grant NGR-27-002-006)

(Paper-E11) CSCL 06C

Improved classification and mapping of grizzly habitat will permit better estimates of population density and distribution, and allow accurate evaluation of the potential effects of changes in land use, hunting regulation, and management policies on existing populations. Methods of identifying favorable habitat from ERTS-1 multispectral scanner imagery were investigated and described. This technique could reduce the time and effort required to classify large wilderness areas in the Western United States. Author

**N74-30814\*** Environmental Research Inst. of Michigan, Ann Arbor.

**UTILITY OF ERTS FOR MONITORING THE BREEDING HABITAT OF MIGRATORY WATERFOWL c04**

Edgar A. Work, Jr., David S. Gilmer (Northern Prairie Wildlife Res. Center), and A. T. Klett (Northern Prairie Wildlife Res. Center) *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1671-1686 refs.

(Paper-E12) CSCL 06C

Since 1968 the Bureau of Sport Fisheries and Wildlife (BSF&W) and the Environmental Research Institute of Michigan have cooperated on developing applications of remote sensing to the management of migratory waterfowl. Basically, this work has been concerned with (1) the assimilation of data on surface water conditions so that the data can be used as an index of annual waterfowl production, and (2) the collection of data on land use and wetland quality so that a measure of habitat carrying capacity is obtained. To date, efforts have been directed toward utilizing ERTS to monitor surface water conditions. An example of a model used for predicting the annual production of mallards (*Anas platyrhynchos*) is presented. The data inputs to this model and the potential for acquiring these data using ERTS are described. Author

## 01 AGRICULTURE AND FORESTRY

**N74-30815\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

### TECHNIQUES FOR COMPUTER-AIDED ANALYSIS OF ERTS-1 DATA, USEFUL IN GEOLOGIC, FOREST AND WATER RESOURCE SURVEYS

Roger M. Hoffer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1687-1708 refs

(Contract NAS5-21880; Grant NGL-15-005-112)

(Paper-11) CSCL 08F

Forestry, geology, and water resource applications were the focus of this study, which involved the use of computer-implemented pattern-recognition techniques to analyze ERTS-1 data. The results have proven the value of computer-aided analysis techniques, even in areas of mountainous terrain. Several analysis capabilities have been developed during these ERTS-1 investigations. A procedure to rotate, deskew, and geometrically scale the MSS data results in 1:24,000 scale printouts that can be directly overlaid on 7 1/2 minutes U.S.G.S. topographic maps. Several scales of computer-enhanced 'false color-infrared' composites of MSS data can be obtained from a digital display unit, and emphasize the tremendous detail present in the ERTS-1 data. A grid can also be superimposed on the displayed data to aid in specifying areas of interest. Author

### N74-30846 Joint Publications Research Service, Arlington, Va. SCIENTIFIC PROJECTS AT PUSHCHINO BIOLOGICAL STUDY CENTER

L. Repetskiy *In its* The Earth's Future and Res. at Pushchino City (JPRS-62356) 1 Jul. 1974 p 13-21 Transl. into ENGLISH from Nauka Zhizn. (USSR), no. 4, 1974 p 106-111

The Pushchino Biological Study Center is described. Research in the areas of microbiology, biophysics, and agrochemistry is reported. E.J.O.

### N74-30864 Joint Publications Research Service, Arlington, Va. INTERPRETING THE SOIL COVER BY SPACE PHOTOGRAPHS

V. I. Kravtsova *In its* Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 168-176 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 133-139

An analysis of the photographs from space, especially color photographs taken from the Soyuz, Gemini and Apollo spacecraft and also from the first orbital station, the Salyut, indicates that it is entirely possible to use them to study the soil cover although the differences in soil types are not reflected so well as, for example, the differences in lithologically nonuniform rock. However, in a number of cases the decipherable peculiarities of the structure of the soil cover can help to study the geological structure of the territory. The examples of deciphering the soil cover on the space photographs, in contrast to their geological deciphering, are quite rare. One of the causes is the strong dependence of the image of the soil cover on the moisture conditions at the time of the survey or during the period directly preceding it. Thus, the effort to study the spotty picture of the soil exchange in the lacustrine depressions of northwestern Nevada turned out to be unsuccessful as a result of the fact that the photographs received with an interval of three months from the Gemini-4 and Gemini-5 spacecraft turned out to be incomparable since they were taken under different moisture conditions.

Author

### N74-30880# Naval Civil Engineering Lab., Port Hueneme, Calif. SOIL MECHANICS AND THE ADVANCED COMPUTER CODES

J. B. Forrest Apr. 1974 35 p refs

(AD-777051; NCEL-TN-1324) Avail: NTIS CSCL 08/13

The report discusses some of the more complex soil models available for input to advanced computer codes. It provides a brief overview of the impact of recent computer code advances upon development within the field of soil mechanics. Two different types of models are discussed: (1) variable moduli models based upon incremental elasticity, and (2) elastic-plastic models in which plastic yielding conditions are superimposed upon elastic behavior. The difficulties involved in using experimental data to fit a soil model are considered briefly and the major requirements for acceptable soil constitutive models are presented. The report concludes that the most fruitful avenue of pursuit for future soil-structure interaction studies will involve a versatile form of the variable moduli model. Author (GRA)

### N74-31107 Joint Publications Research Service, Arlington, Va. EFFECT OF LIGHT AND TEMPERATURE DURING THE FALL ON THE WINTERING AND HARVEST OF WINTER CROPS

A. I. Korovin and Ye. V. Manayev *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 124-135 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 86-93

The experimental results of studying the effect of air temperature, and illumination, during the fall, on the wintering and harvest of winter wheat, and winter rye are discussed.

Author

### N74-31114 Joint Publications Research Service, Arlington, Va. PATHS OF DEVELOPMENT OF AGROMETEOROLOGY AND AGROCLIMATOLOGY

R. A. Konstantinov *In its* Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 169-178 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 109-113

The state-of-the-art of research in the field of agrometeorology and agroclimatology is described, and the causes inhibiting the development of this science are explained. A study was made of the general prospects for the development of agrometeorology and specific goals facing agroclimatology. A basis is provided for considering soil fertility when defining agroclimatic districts, that is, the necessity for evaluating the climatic soil resources of the harvest. Author

### N74-31788\*# Agricultural Research Service, Weslaco, Tex. REFLECTANCE OF VEGETATION, SOIL, AND WATER Progress Report, 19 Jun. - 19 Aug. 1974

Craig L. Wiegand, Principal Investigator Aug. 1974 6 p refs ERTS

(NASA Order S-70251-AG)

(E74-10706; NASA-CR-139539; PR-8) Avail: NTIS HC \$4.00 CSCL 20F

The author has identified the following significant results. The majority of the rangelands of Hidalgo County, Texas are used in cow-calf operations. Continuous year-long grazing is practiced on about 60% of the acreage and some type of deferred system on the rest. Mechanical brush control is used more than chemical control. Ground surveys gave representative estimates for 15 vegetable crops produced in Hidalgo County. ERTS-1 data were used to estimate the acreage of citrus in the county. Combined Kublerka Munk and regression models, that included a term for shadow areas, gave a higher correlation of composite canopy reflectance with ground truth than either model alone.

### N74-31795\*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

### GROUND PATTERN ANALYSIS IN THE GREAT PLAINS Final Report, 1 Aug. 1972 - 15 May 1974

John C. Davis, Fawwaz T. Ulaby, Principal Investigator, and James L. McNaughton May 1974 84 p refs Original contains

imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21822)  
(E74-10714; NASA-CR-139553) Avail: NTIS HC \$7.25 CSCL 08B

**N74-31797\*** Tennessee Univ., Knoxville.  
**EXTENT OF CYCLIC AND CHANGING ECOLOGICAL PHENOMENA AND SEMIPERMANENT VEGETATION-ECOSYSTEM INTERFACE: ECOLOGICAL APPLICATIONS OF ERTS-A IMAGERY** Final Report  
H. R. DeSelm, Principal Investigator 5 Aug. 1974 90 p refs  
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21882)  
(E74-10716; NASA-CR-139548) Avail: NTIS HC \$7.50 CSCL 08F

**N74-31798\*** Tennessee Univ., Knoxville. Dept. of Botany.  
**VEGETATION BOUNDARIES ON ERTS-1 IMAGERY**  
H. R. DeSelm, Principal Investigator and T. W. Taylor 20 Mar. 1973 10 p refs Presented at the Conf. on Earth Resources Observation and Inform. Anal. System, Tullahoma, Tenn., 26-28 Mar. 1973 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21882)  
(E74-10717; NASA-CR-139549) Avail: NTIS HC \$4.00 CSCL 08F

**N74-31799\*** South Dakota State Univ., Brookings. Remote Sensing Inst.  
**[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL]** Monthly Progress Report, Jul. 1974  
Victor I. Myers, Principal Investigator 20 Aug. 1974 2 p EREP  
(Contract NAS9-13337)  
(E74-10718; NASA-CR-139550) Avail: NTIS HC \$4.00 CSCL 08F

**N74-31867\*** South Dakota State Univ., Brookings. Remote Sensing Inst.  
**EVALUATION OF ERTS-1 IMAGERY FOR USE ON THE PINE RIDGE RESERVATION**  
C. J. Frazee, R. L. Carey, and J. L. Gropper Nov. 1973 33 p refs Sponsored by Bur. of Indian Affairs Original contains color illustrations  
(SDSU-RSI-73-10) Avail: NTIS HC \$4.75 CSCL 08B

Agricultural conservation features were identified and general resource areas delineated using ERTS-1 satellite imagery on the Pine Ridge Indian Reservation in southwestern South Dakota. Photo interpretation techniques were used to analyze ERTS-1 imagery taken on August 19, 1972, and May 17, 1973. Utilizing the August 1972 imagery, general soil areas were delineated using photo characteristics, such as drainage patterns, drainage densities, tone, land use patterns, and color. The existing standard soil survey was used to determine the range sites and land capability subclasses comprising the delineated units. Each of

the photo-mapped units interpreted from the ERTS-1 imagery had a unique range site and land capability subclass composition. Therefore, the photo interpreted units delineated on the ERTS-1 imagery were general soil resource areas. Author

**N74-31870\*** Virginia Polytechnic Inst. and State Univ., Blacksburg.  
**SOILS AND MORPHOLOGY OF CAROLINA BAYS, EASTERN SHORE, VIRGINIA** M.S. Thesis  
Daniel John Bliley Apr. 1974 149 p refs  
Avail: NTIS HC \$10.50

Carolina bay landforms were studied on the Eastern Shore of Virginia using aerial infrared imagery. Bays were delineated mainly by contrasting soil and vegetation which was enhanced on the imagery and further verified by field investigations. Typical bay morphology was found in general to be similar to descriptions from other areas. However it was observed that many bays in the study area were more nearly round, and had a more westerly orientation. Consistent strongly developed southeastern rims were not observed as have been reported from other areas. Bays were determined to be non-randomly distributed within the study area. The majority occur along the central backbone of the peninsula in a generally linear fashion and are apparently associated with larger less distinct depressions. The restriction of bay size by associated land surface may be evidenced by a number of small bays occurring on the narrow peninsula south of Wachapreague and the lack of large bays (over 2 miles in length) in the study area. All soils examined had sandy subsurface horizons indicating a sandy environment of bay formation. Size distribution of sandy fractions revealed that differential sorting probably occurred between bay rims and depressions. Author

**N74-32761\*** Agricultural Research Service, Weslaco, Tex.  
**IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING** Monthly Progress Report, Jul. - Aug. 1974  
Craig L. Wiegand, Principal Investigator Aug. 1974 1 p EREP  
(NASA Order T-4105-B)  
(E74-10708; NASA-CR-139541; MPR-8) Avail: NTIS HC \$4.00 CSCL 02C

**N74-32766\*** Northern Prairie Wildlife Research Center, Jamestown, N. Dak.  
**UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT** Monthly Progress Report, Aug. 1974  
David S. Gilmer, Principal Investigator Aug. 1974 3 p EREP  
(NASA Order T-4114-B)  
(E74-10737; NASA-CR-139627) Avail: NTIS HC \$4.00 CSCL 06C

**N74-32767\*** Nebraska Univ., Lincoln. Dept. of Agronomy.  
**EVALUATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA** Semiannual Progress Report, 1 Jan. - 30 Jun. 1974  
James V. Drew, Principal Investigator and Paul M. Seevers Aug. 1974 11 p ref ERTS  
(Contract NAS5-21756)  
(E74-10738; NASA-CR-139628) Avail: NTIS HC \$4.00 CSCL 08B

## 01 AGRICULTURE AND FORESTRY

**N74-32788\*** Texas Univ., Dallas.

**STATISTICAL THEORY AND METHODOLOGY FOR REMOTE SENSING DATA ANALYSIS Final Report, 1 Jun. 1973 - 31 May 1974**

Patrick L. Odell 1 Jun. 1974 196 p refs

(Contract NAS9-13512)

(NASA-CR-134394; JSC-08971) Avail: NTIS HC \$13.00 CSCL 05B

A model is developed for the evaluation of acreages (proportions) of different crop-types over a geographical area using a classification approach and methods for estimating the crop acreages are given. In estimating the acreages of a specific croptype such as wheat, it is suggested to treat the problem as a two-crop problem: wheat vs. nonwheat, since this simplifies the estimation problem considerably. The error analysis and the sample size problem is investigated for the two-crop approach. Certain numerical results for sample sizes are given for a JSC-ERTS-1 data example on wheat identification performance in Hill County, Montana and Burke County, North Dakota. Lastly, for a large area crop acreages inventory a sampling scheme is suggested for acquiring sample data and the problem of crop acreage estimation and the error analysis is discussed. Author

**N74-32809\*** Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

**BURKE COUNTY WHEAT FEASIBILITY STUDY**

W. A. Kunkel Jun. 1974 17 p

(Contract NAS9-12200)

(NASA-CR-140249; LEC-3783) Avail: NTIS HC \$4.00 CSCL 02C

A feasibility study was conducted to determine whether wheat could be distinguished from other small grain crops in a selected spring wheat growing area in Burke County, North Dakota using a maximum likelihood classification program and ERTS 1 multispectral band scanner data. ERTS 1 data scenes were selected from passes made on June 5, 1973 and June 23, 1973. The Univac 1108 computer and the LARSYS pattern recognition software package were used in performing the classification. Results of the analysis are provided. Author

**N74-32810\*** Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

**FEASIBILITY FOR IDENTIFICATION OF WHEAT IN HILL COUNTY, MONTANA**

L. M. Flores Jun. 1974 28 p

(Contract NAS9-12200)

(NASA-CR-140248; LEC-3860) Avail: NTIS HC \$4.50 CSCL 02C

Hill County, Montana was the site chosen for feasibility studies concerning wheat crop identification using ERTS 1 multispectral band scanner data, in which the specific objective was to determine whether wheat is spectrally separable from other crops which are typically grown in wheat producing areas. Available computerized techniques were evaluated for their utility in the investigation. It was found that wheat can be separated from other crops with a classification accuracy of roughly 90 percent or better, and that the best single data set occurs after wheat is fully headed and before it turns yellow. The best overall performance was obtained using the three-pass data set using the best 8 channels, or all 12 channels. A.A.D.

**N74-32822** Freiburg Univ. (West Germany). Abteilung Luftbildmessung und -Interpretation.

**APPLICATION OF SPACELAB TO LAND USE, FORESTRY AND AGRICULTURE**

G. Hildebrandt In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 16 p refs

An operational inventory system of land use, natural and cultivated vegetation is considered. Included are: information

required, useful and usable parameters to get the information by remote sensing, and the information that will be available by advanced remote sensing from space platforms. The experience gained from spectrophotometric analysis of spaceborne images is discussed in detail. ESRO

**N74-32832\*** Israel Program for Scientific Translations, Ltd., Jerusalem.

**ATMOSPHERIC RADIATION STUDIES**

K. Ya. Kondratyev, ed. 1974 225 p refs Transl. into ENGLISH of Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 Sponsored by US-Israel Binatl. Sci. Found.

(TT-74-50010; ISBN-0-7065-1447-5) Avail: NTIS HC \$14.25

Airborne atmospheric radiation measurements for meteorological surveys and forest fire detection.

**N74-32854** Israel Program for Scientific Translations, Ltd., Jerusalem.

**DETECTION OF SMALL INCIPIENT FIRES BY INFRARED SURVEYING**

V. I. Binenko, L. N. Dyachenko, K. Ya. Kondratyev, and A. P. Chernenko In its Atmospheric Radiation Studies (TT-74-50010) 1974 p 203-212 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

The possibilities are examined of using infrared equipment to detect incipient forest fires from aircraft. The infrared detection method is more reliable and promising compared with visual observation from aircraft of the forest protection service. This method makes it possible to detect incipient fires at their earliest stages. Specific data are obtained on the optimum surveillance altitudes for detecting very small (0.5 to 1.5 sq/m) incipient fires. Author

**N74-32855** Israel Program for Scientific Translations, Ltd., Jerusalem.

**INFRARED MAPPING OF LARGE FOREST FIRES**

V. I. Binenko, L. N. Dyachenko, K. Ya. Kondratyev, and A. P. Chernenko In its Atmospheric Radiation Studies (TT-74-50010) 1974 p 213-219 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

The possibility is shown of using scanning infrared cameras to detect all types of forest fires. The use of infrared equipment makes it possible to map large forest fires concealed by a dense blanket of smoke. Here, the location, configuration and intensity of the fire edge, as well as the speed and direction of its travel can be determined. Such information is needed by the forest protection service for developing appropriate fire control tactics. Practical results of this study are technical recommendations for developing special airborne infrared equipment for the forest fire protection service. Author

**N74-33817\*** Servicio Geologico de Bolivia, La Paz.

**BOLIVIAN PARTICIPATION IN THE RESEARCH AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP)**

Carlos E. Brockmann, Principal Investigator Mar. 1974 4 p Sponsored by NASA EREP

(E74-10727; NASA-CR-139573) Avail: NTIS HC \$4.00 CSCL 08B

**N74-33829\*** Wyoming Univ., Laramie. Dept. of Geology. **MULTIDISCIPLINARY STUDY OF WYOMING TEST SITES Progress Report, Apr. - Aug. 1974**

Ronald W. Marrs, Principal Investigator 1 Sep. 1974 22 p



## 01 AGRICULTURE AND FORESTRY

refs EREP

(Contract NAS9-13298)

(E74-10762; NASA-CR-140002; PR-4) Avail: NTIS  
HC \$4.25 CSCL 08F

**N74-33861\*** National Aeronautics and Space Administration.  
Lyndon B. Johnson Space Center, Houston, Tex.

**CORN BLIGHT WATCH EXPERIMENT Summary Report**  
Washington 1974 17 p Original contains color illustrations  
(NASA-SP-353) Avail: NTIS MF \$1.45; SOD HC \$0.55 CSCL  
02C

The corn blight problem is briefly described how the experiment was organized and conducted, the effect of the blight on the 1971 crop, and some conclusions that may be drawn as a result of the experiment. The information is based on preliminary reports of the Corn Blight Watch Steering Committee and incorporates much illustrative material conceived at Purdue University. Author

**N74-33874\*** National Aeronautics and Space Administration.  
Lyndon B. Johnson Space Center, Houston, Tex.

**AGRICULTURE, FORESTRY, RANGE RESOURCES**

William J. Crea In its 3rd ERTS Symp., Vol. 3 May 1974  
p 1-14 refs  
CSCL 08F

In the area of crop specie identification, it has been found that temporal data analysis, preliminary stratification, and unequal probability analysis were several of the factors that contributed to high identification accuracies. Single data set accuracies on fields of greater than 80,000 sq m (20 acres) are in the 70- to 90-percent range; however, with the use of temporal data, accuracies of 95 percent have been reported. Identification accuracy drops off significantly on areas of less than 80,000 sq m (20 acres) as does measurement accuracy. Forest stratification into coniferous and deciduous areas has been accomplished to a 90- to 95-percent accuracy level. Using multistage sampling techniques, the timber volume of a national forest district has been estimated to a confidence level and standard deviation acceptable to the Forest Service at a very favorable cost-benefit time ratio. Range specie/plant community vegetation mapping has been accomplished at various levels of success (69- to 90-percent accuracy). However, several investigators have obtained encouraging initial results in range biomass (forage production) estimation and range readiness predictions. Soil association map correction and soil association mapping in new area appear to have been proven feasible on large areas; however, testing in a complex soil area should be undertaken. Author

**N74-33929#** Earth Satellite Corp., Washington, D.C.

**RANGELAND CASE STUDY Interim Report**

Apr. 1974 242 p refs Prepared jointly with Booz-Allen Applied Research, Inc., Bethesda, Md.  
(Contract D1-14-08-001-13519)  
(PB-232929/0; USGS-DO-74-008) Avail: NTIS HC \$6.00 CSCL  
02B

Rangeland management was selected as a case study because it reflects the multi-purpose goals of rangeland management and identifies earth resources satellite-derived information, including inventories for long term range reallocation, monitoring decisions to improve range productivity, and range feed condition. A prospective earth resources satellite (ERS) system could improve rangeland inventories, could make a coordinated system of rangeland monitoring possible, and improve range feed condition reports. The gross annualized discounted benefits of ERS rangeland applications are estimated to be between \$8.8 and \$30.4 million during the period 1977-86. GRA

**N74-34735\*** Agricultural Research Service, Weslaco, Tex.  
**IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Sep. 1974**

Craig L. Wiegand, Principal Investigator Sep. 1974 2 p  
EREP

(NASA Order T-4105-B)

(E74-10768; NASA-CR-140121; MPR-9) Avail: NTIS  
HC \$3.25 CSCL 02C

**N74-34736\*** Pacific Southwest Forest and Range Experiment  
Station, Berkeley, Calif.

**INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Jul. - 15 Sep. 1974**

Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll,  
Principal Investigators 20 Sep. 1974 6 p EREP

(NASA Order T-4106-B)

(E74-10769; NASA-CR-140122; BMPR-13) Avail: NTIS  
HC \$3.25 CSCL 02F

The author has identified the following significant results. Road systems being developed within the Manitou, Colorado area for human habitation are readily discernible on the S192 normal-color photographs. These are dirt roads, some of which are about 20 feet wide. These data should provide the District Ranger of the Pike National Forest required information on the size and extent of these developing areas, information which he does not now have but is required for total management of the District.

**N74-34737\*** South Dakota State Univ., Brookings. Remote Sensing Inst.

**DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Aug. 1974**

Victor I. Myers, Principal Investigator 20 Sep. 1974 2 p  
EREP

(Contract NAS9-13337)

(E74-10770; NASA-CR-140123) Avail: NTIS HC \$3.25 CSCL  
08F

**N74-34738\*** Northern Prairie Wildlife Research Center,  
Jamestown, N. Dak.

**UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Sep. 1974**

David S. Gilmer, Principal Investigator Sep. 1974 2 p EREP

(NASA Order T-4114-B)

(E74-10771; NASA-CR-140124) Avail: NTIS HC \$3.25 CSCL  
06C

**N74-34751\*** Naval Research Lab., Washington, D.C.

**TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Jul. 1974**

Allan Shapiro, Principal Investigator 16 Sep. 1974 2 p  
EREP

(NASA Order T-4716-B)

(E74-10784; NASA-CR-140137) Avail: NTIS HC \$4.00 CSCL  
08E

## 01 AGRICULTURE AND FORESTRY

**N74-34757\*#** Agricultural Research Service, Weslaco, Tex.  
**IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL  
SALINITY DETECTING Monthly Progress Report, Jul. 1973**  
Craig L. Wiegand, Principal Investigator Aug. 1973 1 p  
EREP

(NASA Order T-4105-B)  
(E74-10790; NASA-CR-140143; MPR-2) Avail: NTIS  
HC \$4.00 CSCL 02C

**N74-34767\*#** Kansas Univ. Center for Research, Inc., Lawrence.  
Remote Sensing Lab.

**RADAR SPECTRAL MEASUREMENTS OF VEGETATION**  
Fawwaz T. Ulaby and Richard K. Moore Aug. 1973 20 p  
refs

(Contract NAS9-10261)  
(NASA-CR-140289; CRES-TR-177-40) Avail: NTIS HC \$4.00  
CSCL 08F

Spectral data of 4-8 GHz radar backscatter were gathered during the 1972 growing season at look angles between 0 and 70 deg and for all four possible polarization linear combinations. The data covers four crop types (corn, milo, alfalfa, and soybeans) and a wide range of soil moisture content. To insure statistical representation of the results, measurements were conducted over 128 fields corresponding to a total of about 40,000 data points. The use of spectral response signatures to separate different crop types and to separate healthy corn from blighted corn was investigated. Author

**N74-34768\*#** Kansas Univ. Center for Research, Inc., Lawrence.  
Remote Sensing Lab.

**AGRICULTURAL TERRAIN SCATTEROMETER OBSERVA-  
TIONS WITH EMPHASIS ON SOIL MOISTURE VARIA-  
TIONS**

C. King Aug. 1973 57 p refs

(Contract NAS9-10261)  
(NASA-CR-140290; CRES-TR-177-44) Avail: NTIS HC \$6.00  
CSCL 08F

Airborne scatterometer observations were made for agricultural terrain in May and June, 1970 at a NASA test site near Garden City, Kansas. Data from 13.3 GHz and 400 MHz scatterometer were analyzed. It was observed that for incidence angle less than 40 degrees, the 13.3 GHz data showed a difference in backscatter from wet and dry fields of the order of 7 db. The averages of the various crop types were within a spread of only 5 db. Other ground parameters such as cultivation pattern and vegetation row effects showed even less distinguishing characteristics on the backscatter. The 400 MHz data also showed a slight moisture dependency. Author

**N74-34773\*#** Texas A&M Univ., College Station. Remote  
Sensing Center.

**DUAL FREQUENCY MICROWAVE RADIOMETER MEAS-  
UREMENTS OF SOIL MOISTURE FOR BARE AND VEGETA-  
TED ROUGH SURFACES**

Siu lim Lee Aug. 1974 230 p refs

(Grant NGL-44-001-001; Contract NAS9-13904)  
(NASA-CR-140515; RSC-56) Avail: NTIS HC \$14.50 CSCL  
08M

Controlled ground-based passive microwave radiometric measurements on soil moisture were conducted to determine the effects of terrain surface roughness and vegetation on microwave emission. Theoretical predictions were compared with the experimental results and with some recent airborne radiometric measurements. The relationship of soil moisture to the permittivity for the soil was obtained in the laboratory. A dual frequency radiometer, 1.41356 GHz and 10.69 GHz, took measurements at angles between 0 and 50 degrees from an altitude of about fifty feet. Distinct surface roughnesses were studied. With the roughness undisturbed, oats were later planted and vegetated

and bare field measurements were compared. The 1.4 GHz radiometer was less affected than the 10.6 GHz radiometer, which under vegetated conditions was incapable of detecting soil moisture. The bare surface theoretical model was inadequate, although the vegetation model appeared to be valid. Moisture parameters to correlate apparent temperature with soil moisture were compared. Author

**N74-34793\*#** Pan American Univ., Edinburg, Tex.

**AN EXPERIMENTAL TEST OF PLANT CANOPY REFLEC-  
TANCE MODELS ON COTTON Final Report, 1 Sep. 1973 -  
31 Aug. 1974**

E. W. LeMaster Oct. 1974 16 p refs

(Grant NGR-44-087-001)

(NASA-CR-140588) Avail: NTIS HC \$4.00 CSCL 02C

Extensive data on the plant parameters necessary to evaluate any model are presented for a cotton crop. The variation of the bidirectional reflectance function with observer altitude, observer azimuth, and sun altitude angle is presented for a high density cotton crop having leaf index of 19. A comparison with the quantitative behavior obtained from the Suits model is accomplished in the wavelength region from 400 nm to 1050 nm. Author

## ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

**A74-39610 \*** Particulate sizes from polarization measurements. J. G. Kuriyan (California, University, Los Angeles, Calif.). In: UCLA International Conference on Radiation and Remote Probing of the Atmosphere, Los Angeles, Calif., August 28-30, 1973, Proceedings. North Hollywood, Calif., Western Periodicals Co., 1974, p. 337-366. 12 refs. Research sponsored by the U.S. Department of Transportation and NASA.

An experiment with a ground-based polarimeter is described. It is shown that the optical properties of particles in the atmosphere can be inferred on the basis of the measured data of the radiation field. The results of the investigation demonstrate that the turbid atmosphere can be continually monitored with the aid of remote measurements of polarization and intensity. G.R.

**A74-39614** Infrared remote sounding. C. D. Rodgers (Oxford University, Oxford, England). In: UCLA International Conference on Radiation and Remote Probing of the Atmosphere, Los Angeles, Calif., August 28-30, 1973, Proceedings. North Hollywood, Calif., Western Periodicals Co., 1974, p. 471-506. 14 refs.

The theory of radiative transfer is considered, taking into account approaches for measuring the temperature profile, the distribution of absorbing gas, and problems presented by the presence of clouds. The two aspects of the retrieval problem are examined. The equation of transfer has to be inverted so that the atmospheric state is expressed as a function of the observed radiation. The second aspect is concerned with the information content of the observations. Experimental techniques are discussed along with some applications of remote sounding. G.R.

**A74-40315** High-resolution infrared spectrometry applied to the study of minor constituents of the atmosphere and atmospheric pollutants (Spectrométrie infrarouge à haute résolution appliquée à l'étude de constituants mineurs de l'atmosphère et de polluants atmosphériques). D. Barges, Paris VI, Université, Dr.-Ing. Thesis, 1973. 91 p. 33 refs. In French. (ONERA-NT-213)

Development of numerical data processing methods suitable for high-resolution spectrometers, and description of experimental determinations of atmospheric constituents carried out with the aid of grating spectrometers. Following a general review of the theory of the grating spectrometer, a study is made of the signal modulation provided by various types of gratings. The characteristics and the performance of the numerical data acquisition circuit are cited. The various methods of data processing are divided into two categories which include methods designed to improve the accuracy of the line definition (numerical filtering and double derivation) and a method for achieving an a posteriori improvement in the resolution by numerical reconstruction of the frequencies not transmitted by the spectrometer (deconvolution). Finally, the results of laboratory studies of the nu sub 2 band of ammonia at 10 microns and the atmospheric spectrum between 7 and 8 microns are presented.

A.B.K.

**A74-41968** Airborne and balloonborne spectroscopy for the study of atmospheric gas pollutants. M. Ackerman, D. Frimout (Institut d'Aéronomie Spatiale de Belgique, Brussels, Belgium), J.-C. Fontanella, A. Girard, R. Gobin, L. Gramont, and N. Louisnard (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). (Joint Conference on Sensing of Environmental Pollutants, 2nd, Washington, D.C., Dec. 10-12, 1973.) ONERA, TP no. 1309, 1973. 9 p. Research supported by the Groupe d'Etudes sur les Conséquences des Vols Stratosphériques, Centre National d'Etudes Spatiales and U.S. Department of Transportation.

Infrared absorption spectrometry was recently used from aircraft and balloon for analyzing concentrations of minor constituents of the stratosphere, using the sun as a source, seen tangentially to the earth. Grille spectrometers with a resolution limit close to that of their gratings were used in connection with sun seekers. The vertical profile of NO between 20 and 40 km altitude was determined for the first time. Number density of NO<sub>2</sub> at 16 km was found to be about 1 billion per cu cm. Other results obtained in the 1300 per cm absorption band of HNO<sub>3</sub> are presented. (Author)

**A74-42087 \* #** Evaluation of Skylab data for land use mapping. L. L. Biehl and L. F. Silva (Purdue University, West Lafayette, Ind.). American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-143. 38 p. 7 refs. Contract No. NAS9-13301.

The present work compares four multispectral data sets acquired within a 24-hour time period over an area in south-central Indiana in a land use analysis of the study area. Data sets were acquired by the 4-channel multispectral scanner (MSS) on the ERTS satellite, the Earth Resource Environmental Package (EREP) 13-channel MSS on Skylab, the color infrared photography from the EREP camera system, and the black and white multiband photography from the EREP camera system. Overall performance of MSS data sets was better than that of digitized photographic data sets. Digitized color IR data sets were better overall than digitized black and white sets. Also, overall performance of 'optimum' four channels in Skylab MSS data set was essentially the same as that for the ERTS MSS data sets. However, when the four channels in the Skylab MSS which most nearly correspond to those in the ERTS MSS were used, overall performance of Skylab MSS data set was significantly lower than that for the ERTS MSS. P.T.H.

**A74-42809** Remote sensing for environmental planning surveys. L. F. Curtis (Bristol, University, Bristol, England). In: Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 87-109. 48 refs.

The remote sensing techniques available for environmental monitoring are discussed with special reference to remote sensing platforms and sensing systems. Examples of remote sensing studies using infra-red line-scan and multiband photography in Britain are described. Particular applications of infra-red line-scan to shelter-belt studies in rural areas are outlined. Multiband photography is examined in respect of its potential application to land-use, soil and vegetation studies. Illustrations of the use of image enhancement by color additive methods are included, together with examples of densitometer measurements from multiband photography. (Author)

**A74-43297 \* #** Inadvertent weather modification by Chicago-northern Indiana pollution sources observed by ERTS-1. W. A. Lyons (Wisconsin, University, Milwaukee, Wis.). Monthly Weather Review, vol. 102, July 1974, p. 503-508. 18 refs. Research supported by the University of Wisconsin; U.S. Environmental Protection Agency Grant No. R-800873; NSF Grant No. GA-32208; Contract No. NASS-21736.

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Discussion of an apparent case of cloud modification by the effluents from numerous industrial sites in the Chicago-Gary complex. An analysis is made of a series of ERTS-1 images taken over Lake Michigan on Nov. 24, 1972, which apparently show modification of 1.5-km-wide cumulus cloud streets by the effluents of the industries at the southern end of the lake. A close inspection of these images reveals numerous interesting phenomena, the most important of which is the apparent alteration of the cumulus clouds along the axis of the major pollution plumes. A.B.K.

**A74-45390 \* #** Preliminary analysis of an extensive one year survey of trace elements and compounds in the suspended particulate matter in Cleveland, Ohio. R. B. King, J. S. Fordyce, A. C. Antoine, H. F. Leibeck, H. E. Neustadter, S. M. Sidik (NASA, Lewis Research Center, Cleveland, Ohio), J. C. Burr (Ohio Environmental Protection Agency, Columbus, Ohio), G. T. Craig, and C. L. Cornett (Cleveland Division of Air Pollution Control, Cleveland, Ohio). *Earth Environmental Resources Conference, Philadelphia, Pa., Sept. 10-12, 1974, Paper. 2 p.*

Preliminary review of a study of trace elements and compound concentrations in the ambient suspended particulate matter in Cleveland, Ohio, measured from August 1971 through June 1973, as a function of source, monitoring location, and meteorological conditions. The study is aimed at the development of techniques for identifying specific pollution sources which could be integrated into a practical system readily usable by an enforcement agency. M.V.E.

**N74-29693\* #** Geological Survey, Reston, Va.  
**AN EXPERIMENT IN CULTURAL INTERPRETATION AND MAP REVISION FROM SKYLAB DATA** Progress Report, 1 Nov. 1973 - 1 Jul. 1974  
William J. Kosco, Principal Investigator 1 Jul. 1974 3 p ERTS  
(NASA Order S-70243-AG)  
(E74-10662; NASA-CR-138894) Avail: NTIS HC \$4.00 CSCL 08B

The author has identified the following significant results. S190-A imagery is suitable for input to map compilation and revision at scales from 1:1,000,000 to 1:250,000.

**N74-29695\* #** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.  
**STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA** Quarterly Progress Report, 1 Mar. - 31 May 1974  
Frederick J. Thomson, Principal Investigator 17 Jul. 1974 3 p EREP  
(Contract NAS9-13272)  
(E74-10664; NASA-CR-138896; ERIM-101700-15-L; QPR-5)  
Avail: NTIS HC \$4.00 CSCL 05B

**N74-29704\* #** Tennessee Univ., Knoxville. Civil Engineering Dept.  
**EFFECTS OF ATMOSPHERIC AEROSOLS ON SCATTERING REFLECTED VISIBLE LIGHT FROM EARTH RESOURCE FEATURES** Final Report  
Kenneth E. Noll, Bruce A. Tschantz, and Wayne T. Davis 31 Dec. 1972 92 p refs  
(Grant NGL-43-001-021)  
(NASA-CR-139382) Avail: NTIS HC \$7.75 CSCL 04A

The vertical variations in atmospheric light attenuation under ambient conditions were identified, and a method through which aerial photographs of earth features might be corrected to yield quantitative information about the actual features was provided. A theoretical equation was developed based on the Bouguer-Lambert extinction law and basic photographic theory. Author

**N74-29711\* #** Oregon State Univ., Corvallis.  
**SECOND-YEAR PROJECTS AND ACTIVITIES OF THE ENVIRONMENTAL REMOTE SENSING APPLICATIONS LABORATORY (ERSAL)** Annual Progress Report, 1 Apr. 1973 - 31 Mar. 1974  
David A. Mouat and Barry J. Schrupf 31 Mar. 1974 39 p refs  
(Grant NGL-38-002-053)  
(NASA-CR-139380) Avail: NTIS HC \$5.00 CSCL 05B  
The activities and projects of ERSAL are reported. Author

**N74-29712\* #** Alabama A & M Univ., Normal.  
**INVESTIGATION OF WATER QUALITY PARAMETERS AT SELECTED POINTS ON THE TENNESSEE RIVER** Final Report, 1 Jun. 1972 - 1 Sep. 1973  
Martin C. Manger 1 Sep. 1973 43 p  
(Grant NGR-01-001-018)  
(NASA-CR-139365) Avail: NTIS HC \$5.25 CSCL 08H  
Physical, chemical, and biological water quality parameters have been investigated at the Widow's Creek steam plant. The water quality parameters and field site locations have been selected so as to be compatible with the interests and needs of the Environmental Application Office at Marshall Space Flight Center. All sampling and testing was conducted as directed in the 13th Edition of Standard Methods of Analysis for Water and Waste Water or as suggested by NASA's Technical Officer. Data is presented in a form compatible with that presently being collected by other agencies. Author

**N74-29714\* #** Stanford Univ., Calif. Electronics Labs.  
**AN OCCULTATION SATELLITE SYSTEM FOR DETERMINING PRESSURE LEVELS IN THE ATMOSPHERE**  
A. R. Morrison, S. G. Vngar, and B. B. Lusignan [1974] 189 p refs  
(Contracts NAS1-9962; NAS1-9963)  
(NASA-CR-132436) Avail: NTIS HC \$12.50 CSCL 04A

A two-satellite microwave occultation system is described that will fix, as an absolute function of altitude, the pressure-temperature profile generated by a passive infrared sounder. The 300 mb pressure level is determined to within 24 m rms, assuming the temperature errors produced by the infrared sensor are not greater than 2 K rms. Error caused by water vapor in the radio path is corrected by climatological adjustments. A ground test of the proposed system is described. A microwave signal propagating between two mountain tops was found to be subject to periods of intense fading. Computer analysis of the raypath between the transmitting and receiving stations indicates that multipath and defocusing were responsible for this fading. It is unlikely that an operational pressure-reference-level system will be subject to the deep fades observed in the ground test, because the phenomena are associated with lower altitudes than the closest approach altitude of an occultation-system raypath. Author

**N74-29715\* #** Hawaii Univ., Honolulu.  
**CATALOG OF DATA SUMMARY OF AIRGLOW OBSERVATIONS OBTAINED AT HALEAKALA, HAWAII** Final Report  
Walter R. Steiger and LeRoi L. Smith (Battelle Memorial Inst., Richland, Wash.) 1974 163 p refs  
(Grant NGR-12-001-001)  
(NASA-CR-139376) Avail: NTIS HC \$11.25 CSCL 04A

The airglow studies were initiated in July 1961 in response to the discovery of unusual phenomena in the tropical airglow as observed from Algeria. Hawaii, being the southern-most area in the United States and within the tropics, and possessing high mountains with frequent clear skies well isolated from the contaminating light and dust of civilization, appeared to be an ideal location for establishing a tropical airglow station. The University of Hawaii was already developing the Mees Solar Laboratory on Haleakala on the island of Maui, so that the addition of a night sky observatory was a natural development.

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

The collection of data covers a span of about seven and one-half years, including the minimum of the solar cycle in 1963 and just getting into the next maximum in 1968-69. It was unfortunate that financial limitations did not permit the continuation of the observations through one complete solar cycle.

Author

**N74-29753#** Earth Satellite Corp., Washington, D.C.  
**AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMUM WEATHER**

Robin I. Welch, Allan D. Marmelstein, and Paul M. Maughan  
 Sep. 1973 63 p refs  
 (Contract EPA-68-01-0191)  
 (PB-231817/8; EPA-R2-73-243) Avail: NTIS MF \$1.45; SOD  
 HC \$1.40 as EP1.23/2:73-243 CSCL 13B

Multiband aerial photography was acquired during specified conditions of cloud cover and reduced visibility considered to be representative of a nearly infinite range of suboptimum weather conditions. Results indicated that only one film tested, a high sensitivity color positive film, provided consistently interpretable results. Rapid access techniques were also evaluated leading to recommendations for a tactical system providing a capability for both realtime and near realtime system update during suboptimum serial photographic conditions. GRA

**N74-30034** Freie Univ., Berlin (West Germany). Inst. for Meteorology.

**METEOROLOGICAL DATA. VOLUME 139, NO. 3: THE EUROPEAN CLIMATOLOGY METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION. PART 3, 3RD QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT 3: DAS EUROPÄISCHE WETTERBILD 1973 WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 3, 3. VIERTELJAHR]**  
 1973 198 p refs In GERMAN

Avail: Issuing Activity

The present volume continues the daily European weather maps for the 3rd quarter in 1973. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer. Transl. by G.G.

**N74-30041** Freie Univ., Berlin (West Germany).  
**METEOROLOGICAL DATA. VOLUME 139, NO. 2: THE EUROPEAN CLIMATOLOGY 1973. METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION. PART 2, 2nd QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT 2: DAS EUROPÄISCHE WETTERBILD 1973. WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 2, 2. VIERTELJAHR]**  
 1973 191 p In GERMAN

Avail: Issuing Activity

The present volume continues the daily European weather maps for the 2nd quarter of 1973. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer. Transl. by G.G.

**N74-30051#** Environmental Protection Agency, Research Triangle Park, N.C. National Air Data Branch.  
**NATIONAL EMISSIONS REPORT, 1972. NATIONAL EMISSIONS DATA SYSTEM (NEDS) OF THE AEROMETRIC AND EMISSIONS REPORTING SYSTEM (AEROS)**  
 Jun. 1974 434 p  
 (EPA-450/2-74-012) Avail: NTIS HC \$24.75

Annual cumulative estimates are presented of source emissions of five criteria pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. Source emissions data are reported to the U.S. Environmental Protection Agency. Summary data are presented for the nation as a whole, for individual states, and for Air Quality Control Regions and individual interstate portions thereof. The data compilations result

from the operations of the National Emissions Data System, which functions as a component of the comprehensive EPA air information system-the Aerometric and Emissions Reporting System.  
 Author

**N74-30055\*#** Northeastern Univ., Boston, Mass.  
**STUDY OF AIR POLLUTANT SIGNATURES FOR REMOTE SENSING Final Report**

Welville B. Nowak 30 Jun. 1974 51 p refs  
 (Grant NGR-22-011-072)

(NASA-CR-138966) Avail: NTIS HC \$5.75 CSCL 13B

Experimental results are presented for a possible new, indirect signature for air pollutants: the spectral reflectivity of plant leaves. Sub-visual changes (up to 160%) in the spectral reflectivity of bean and tobacco leaves were observed over the range 475nm to 750nm in response to SO<sub>2</sub> exposures such as 2ppm/4hrs or 4ppm/16hrs, or to O<sub>3</sub> exposures such as 90pphm/21hrs or 7.5pphm/292hrs. Such changes might be observed from a satellite using either laser or sunlight as the illumination source. Inasmuch as the plants appear to become acclimated to some of these exposure doses, environmental changes may be most important for this type of plant-response.

Author

**N74-30056#** National Environmental Satellite Service, Washington, D.C.

**ENVIRONMENTAL SATELLITE IMAGERY**

Jun. 1974 95 p refs

Avail: NTIS HC \$7.75

Hemispheric mosaics containing climatological and cloud pattern data are shown which were derived from Scanning Radiometer imagery obtained by the NOAA 3 satellite. Data obtained by the Very High Resolution Radiometer, which operates simultaneously with the Scanning Radiometer and views a portion of the same swath at higher resolution, are also given. Information on the date, time of day, orbit number, track, latitude range, and hemisphere viewed is included with each picture. Instrumentation, imaging techniques, and data processing are briefly discussed, and an availability reference is given for acquiring photographic copies of the mosaics shown. A.A.D.

**N74-30669\*#** Geological Survey, Reston, Va. Geographic Applications Program.

**URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, May 1974**

Robert Alexander, Principal Investigator and Harry F. Lins, Jr.  
 20 May 1974 3 p EREP  
 (NASA Order T-5290-B)

(E74-10677; NASA-CR-139244) Avail: NTIS HC \$4.00 CSCL 08B

**N74-30674\*#** Minnesota State Planning Agency, St. Paul.  
**APPLICATION OF ERTS-1 IMAGERY TO STATE WIDE LAND INFORMATION SYSTEM IN MINNESOTA Progress Report, Jan. - Jun. 1974**

Joseph Sizer, John R. Borchert, Principal Investigators, Dwight A. Brown, Merle P. Meyer, Richard Rust, Richard H. Skaggs, Joseph Ulliman, Joseph C. Gibson, Eliahu Stern, John Harrington et al Jul. 1974 11 p Prepared in cooperation with Minnesota Univ., Minneapolis ERTS  
 (Contract NAS5-21801)

(E74-10682; NASA-CR-139247) Avail: NTIS HC \$4.00 CSCL 08F

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

**N74-30676\*** Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.

**DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Jul. 1974**

Joe R. Eagleman, Principal Investigator, Norman Hardy, and Surendra Parashar Jul. 1974 17 p refs EREP

(Contract NAS9-13273)

(E74-10684; NASA-CR-139251) Avail: NTIS HC \$4.00 CSCL 08H

**N74-30684\*** Boeing Co., Kent, Wash.

**QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Jun. - Jul. 1974**

David L. Tingey, Principal Investigator Jul. 1974 1 p EREP (Contract NAS9-13303)

(E74-10694; NASA-CR-139227) Avail: NTIS HC \$4.00

**N74-30685\*** Construction Engineering Research Lab., Champaign, Ill.

**EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 9 Jun. - 8 Aug. 1974**

Ravinder Jain, K., Principal Investigator 8 Aug. 1974 1 p ERTS

(NASA Order S-70255-AG)

(E74-10695; NASA-CR-139228) Avail: NTIS HC \$4.00 CSCL 08H

**N74-30694#** Ludwig-Maximilians-Universität, Munich (West Germany).

**MEASUREMENTS OF EARTH MAGNETIC FIELD ALONG PROFILES IN THE BEGINNING NORTHERN ALPS AND IN THE ALPINE MOUNTAINS (DELTA Z, DELTA T), 1964 - 1973 [VERMESSUNG DES ERDMAGNETISCHEN FELDES LAENGSS PROFILEN IM NOERDLICHEN ALPENVORLAND UND IN DEN ALPEN (DELTA Z, DELTA T), 1964 - 1973] 1974 44 p refs In GERMAN**

Avail: NTIS HC \$5.25

Geomagnetic anomalies are mapped according to intensity and dimensions and some geomorphological models are stipulated for deep rock formations.

**N74-30710\*** Purdue Univ., Lafayette, Ind.

**AN EVALUATION OF MACHINE PROCESSING TECHNIQUES OF ERTS-1 DATA FOR USER APPLICATIONS**

David Landgrebe /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 41-73 refs

(Contract NAS5-21773; Grant NGL-15-005-112)

(Paper-A3) CSCL 09B

A broad study is described to evaluate a set of machine analysis and processing techniques applied to ERTS-1 data. Based on the analysis results in urban land use analysis and soil association mapping together with previously reported results in general earth surface feature identification and crop species classification, a profile of general applicability of this procedure is beginning to emerge. Put in the hands of a user who knows well the information needed from the data and also is familiar with the region to be analyzed it appears that significantly useful

information can be generated by these methods. When supported by preprocessing techniques such as the geometric correction and temporal registration capabilities, final products readily useable by user agencies appear possible. In parallel with application, through further research, there is much potential for further development of these techniques both with regard to providing higher performance and in new situations not yet studied.

Author

**N74-30716\*** Forest Management Inst., Ottawa (Ontario).

**SO2 DAMAGE TO FORESTS RECORDED BY ERTS-1**

Peter A. Murtha /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 137-143 refs

(Paper-A9) CSCL 02F

Sulfur dioxide fumes have been affecting the forests around Wawa, Ontario, which have been under surveillance for a number of years and were recently covered by ultra-small-scale (1:160,000) air photography for damage-assessment purposes. Image interpretation supported by electronic color enhancement was used to delineate on ERTS imagery three damage zones (total-kill, heavy-kill and medium-damage zones). The zones delineated on ERTS imagery are similar to the results of aerial sketch-mapping and air photo interpretation. Band 5 provided the greatest detail for assessing the damage to the forests, followed in successive order by bands 4, 6 and 7. Comparison with ERTS images obtained in the winter showed that even though the total-kill could be separated from heavy-kill damage zones, total-kill could not be consistently separated from clear-cut logging, burned areas, frozen lakes and bogs.

Author

**N74-30730\*** Geological Survey, Washington, D.C.

**REMOTE SENSING OF LAND USE CHANGES IN US METROPOLITAN REGIONS: TECHNIQUES OF ANALYSIS AND OPPORTUNITIES FOR APPLICATION**

James R. Wray /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 339

(Paper-L2) CSCL 08B

A graphic description is given of the Census Cities ERTS experiment in urban change detection using remote sensors. The relationship or model between land use data from sensors and socio-demographic data from the census is partly demonstrated. The example suggests how knowledge of land use changes acquired by sensors can be used to make estimates of population, and other attributes. The feasibility of nationwide mapping of land use, and land use changes, by direct computer classification of ERTS-1 multispectral digital data is also demonstrated. Potential applications in state and regional planning are many, and some are named. But the longer-range gains are likely to be improved understanding by legislators, managers and voters as to what it is that makes the country tick. One of the specific tasks could be the allocation of revenues to be shared.

Author

**N74-30731\*** Minnesota Univ., Minneapolis.

**ERTS-1 ROLE IN LAND MANAGEMENT AND PLANNING IN MINNESOTA**

Joseph E. Sizer (Minn. State Planning Agency) and Dwight Brown /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A. 1974 p 341-350

(Paper-L3) CSCL 08B

Research on applications of ERTS-1 imagery to land use has focused on evaluating the ability of ERTS-1 imagery to update and refine the detail of land use information in the Minnesota Land Management Information System. Work has been directed toward defining the capabilities of the ERTS-1 system to provide information about surface cover by identifying forest, water, and wetland resources; urban and agricultural development; and testing and evaluating data input and output procedures. As capabilities were developed, meetings were held with administra-

tors and resource information users from various agencies of government to identify their information needs. A full scale systems test for several selected pilot areas in the state is nearly complete. Users have been identified for each test area and they have been instrumental in identifying data requirements and analysis needs for administrative purposes. Users have both rural and urban orientations and provide a basis for evaluation of the results.

Author

**N74-30732\*** General Electric Co., Philadelphia, Pa. Space Div.

**INTERACTIVE ANALYSIS AND EVALUATION OF ERTS DATA FOR REGIONAL PLANNING AND URBAN DEVELOPMENT: A LOS ANGELES BASIN CASE STUDY**

Surendra Raje, Richard Economy, Gerald Willoughby (OVAACS Intern., Inc.), and Jene McKnight (Regional Planning Commission, Los Angeles) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 351-369

(Paper-L4) CSCL 08B

The progression endemic to the ERTS Data Use Experiment SR 124 in data quality, analysis sophistication and applications responsiveness is reviewed. The roles of the variety of ERTS products, including the supporting underflight aircraft imagery at various scales, are discussed in the context of this investigation. The versatility of interpretation techniques and outputs developed and implemented via the General Electric Multispectral Information Extraction Systems is described and exemplified by both system-expository and applications-explanatory products. The wide-ranging and in-depth applications studied in the course of this experiment can be characterized as community-oriented and agency-directed. In the former, generic category, which is primarily data-contentual, problems analyzed dealt with agricultural systems, surface water bodies, snow cover, brush fire burns, forestry, grass growth, parks - golf courses - cemeteries, dust storms, grading sites, geological features and coastal water structure. The ERTS MSS band selectivity and measurements thresholds were of primary interest here. The agency-directed application areas have been user-evaluational in nature. Beginning with overall urbanized regional analysis of land cover density-development intensity, residential areas were analyzed for ascertaining if housing types could be aggregated with any degree of reliability.

Author

**N74-30733\*** Dartmouth Coll., Hanover, N.H. Project in Remote Sensing.

**EVALUATION OF ERTS-1 DATA FOR ACQUIRING LAND USE DATA OF NORTHERN MEGALOPOLIS**

Robert B. Simpson, David T. Lindgren, and William D. Goldstein *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 371-381

(Paper-L5) CSCL 08B

State planners are increasingly becoming interested in ERTS as a possible method for acquiring land use data. An important consideration to them is whether ERTS can provide such data at a savings in both time and money over alternative systems. A preliminary evaluation of ERTS as a planning tool is given.

Author

**N74-30734\*** National Physical Research Lab., Pretoria (South Africa).

**THE VALUE OF ERTS-1 IMAGERY IN RESOURCE INVENTORIZATION ON A NATIONAL SCALE IN SOUTH AFRICA**

O. G. Malan, C. N. MacVicar (Soil and Irrigation Res. Inst., Pretoria), D. Edwards (Botan. Res. Inst., Pretoria), B. N. Temperley (Geol. Survey, Pretoria), L. Claassen (Dept. of Planning and the Environ., Pretoria) et al *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 383-392

(Paper-L6) CSCL 08B

It has been shown that ERTS imagery, particularly in the form of 1:500,000 scale false color photolithographic prints, can contribute very significantly towards facilitating and accelerating (dramatically, in some cases) resource surveys and geologic mapping. Fire mapping on a national scale becomes a feasibility; numerous new geologic features, particularly lineaments, have been discovered, land use can be mapped efficiently on a regional scale and degraded areas identified. The first detailed tectonic and geomorphological maps of the Republic of South Africa will be published mainly owing to the availability of ERTS images.

Author

**N74-30735\*** Geological Survey, Washington, D.C. Geographic Applications Program.

**CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1973: ERTS AS AN AID IN A NATIONWIDE PROGRAM FOR MAPPING GENERAL LAND USE**

John L. Place *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 393-423

(Paper-L7) CSCL 08B

Changes in land use between 1970 and 1973 in the Phoenix (1:250,000 scale) Quadrangle in Arizona have been mapped using only the images from ERTS-1, tending to verify the utility of a standard land use classification system proposed for use with ERTS images. Types of changes detected have been: (1) new residential development of former cropland and rangeland; (2) new cropland from the desert; and (3) new reservoir fill-up. The seasonal changing of vegetation patterns in ERTS has complemented air photos in delimiting the boundaries of some land use types. ERTS images, in combination with other sources of information, can assist in mapping the generalized land use of the fifty states by the standard 1:250,000 quadrangles. Several states are already working cooperatively in this type of mapping.

Author

**N74-30736\*** Wisconsin Univ., Madison. Environmental Monitoring and Data Acquisition Group.

**THE APPLICATION OF ERTS-1 DATA TO THE LAND USE PLANNING PROCESS**

James L. Clapp, Ralph W. Kiefer, Edward L. Kuhlmeier, and Bernard J. Niemann, Jr. *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 425-438

(Paper-L8) CSCL 08B

Land resource data has been extracted on a percent of cell basis from ERTS imagery. RB-57 color infrared imagery and best available conventional sources for a 10,000 square kilometer test area in eastern Wisconsin. First, the data from the three sources is compared on a spatial basis for a 300 square kilometer portion of the test area. For those land resource variables associated with cover, ERTS derived resource data compared favorably with both the RB-57 and conventional data. Second, the effect of the data source on land use decisions is examined. Three interstate highway corridors are located through the same region based upon data extracted from each of the three sources. A policy of preserving natural environmental systems was used as a basis for the corridors selection in each case. The resulting three corridors compare favorably.

Author

**N74-30737\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**THE UTILITY OF ERTS-1 DATA FOR APPLICATIONS IN LAND USE CLASSIFICATION**

John E. Dornbach and Gerald E. McKain *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 439-455 refs

(Paper-L9) CSCL 08B

A comprehensive study has been undertaken to determine the extent to which conventional image interpretation and computer-aided (spectral pattern recognition) analysis techniques

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

using ERTS-1 data could be used to detect, identify (classify), locate, and measure current land use over large geographic areas. It can be concluded that most of the level 1 and 2 categories in the USGS Circular no. 671 can be detected in the Houston-Gulf Coast area using a combination of both techniques for analysis. These capabilities could be exercised over larger geographic areas, however, certain factors such as different vegetative cover, topography, etc. may have to be considered in other geographic regions. The best results in identification (classification), location, and measurement of level 1 and 2 type categories appear to be obtainable through automatic data processing of multispectral scanner computer compatible tapes. Author

**N74-30738\*** California Univ., Santa Barbara. Geography Remote Sensing Unit (GRSU).

### **APPLICATION OF ERTS-1 SATELLITE IMAGERY FOR LAND USE MAPPING AND RESOURCE INVENTORIES IN THE CENTRAL COASTAL REGION OF CALIFORNIA**

John E. Estes, Randolph R. Thaman, and Leslie W. Senger *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 457-490

(Paper-L10) CSCL 08B

ERTS-1 satellite imagery has proved a valuable data source for land use as well as natural and cultural resource studies on a regional basis. ERTS-1 data also provide an excellent base for mapping resource related features and phenomena. These investigations are focused on a number of potential applications which are already showing promise of having operational utility. Author

**N74-30739\*** Cornell Univ., Ithaca, N.Y. New York State Coll. of Agriculture and Life Sciences.

### **EVALUATION OF ERTS-1 IMAGERY FOR LAND USE/RESOURCE INVENTORY INFORMATION**

Ernest E. Hardy, James E. Skaley, and Elmer S. Phillips *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 491-495

(Paper-L11) CSCL 08B

This investigation was to develop a low cost, manual technique for enhancing ERTS-1 imagery and preparing it in suitable format for use by users with wide and varied interests related to land use and natural resources information. The goals were: to develop enhancement techniques based on concepts and practices extant in photographic sciences, to provide a means of allowing productive interpretation of the imagery by manual means, to produce a product at low cost, to provide a product that would have wide applications, and one compatible with existing information systems. Cost of preparation of the photographically enhanced, enlarged negatives and positives and the diazo materials is about 1 cent per square mile. Cost of creating and mapping a land use classification of twelve use types at a scale of 1:250,000 is only \$1 per square mile. The product is understood by users, is economical, and is compatible with existing information systems. Author

**N74-30742\*** Food and Agriculture Organization of the United Nations, Rome (Italy).

### **CONCEPTS OF INTEGRATED SATELLITE SURVEYS**

J. A. Howard *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 523-537 refs

(Paper-L14) CSCL 22C

The United Nations initially contracted with NASA to carry out investigations in three countries; but now as the result of rapidly increasing interest, ERTS imagery has been/is being used in 7 additional projects related to agriculture, forestry, land-use, soils, landforms and hydrology. Initially the ERTS frames were simply used to provide a synoptic view of a large area of a developing country as a basis to regional surveys. From this,

interest has extended to using reconstituted false color imagery and latterly, in co-operation with Purdue University, the use of computer generated false color mosaics and computer generated large scale maps. As many developing countries are inadequately mapped and frequently rely on outdated maps, the ERTS imagery is considered to provide a very wide spectrum of valuable data. Thematic maps can be readily prepared at a scale of 1:250,000 using standard NASA imagery. These provide coverage of areas not previously mapped and provide supplementary information and enable existing maps to be up-dated. There is also increasing evidence that ERTS imagery is useful for temporal studies and for providing a new dimension in integrated surveys. Author

**N74-30745\*** Engineer Agency for Resources Inventories, Washington, D.C.

### **AN OPERATIONAL APPLICATION OF ERTS-1 IMAGERY TO THE ENVIRONMENTAL INVENTORY PROCESS**

James D. O'Neal and James R. Bwins *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 579-584

(Paper-L17) CSCL 08F

A discussion is presented of how The Engineer Agency for Resources Inventories utilized ERTS remotely sensed imagery as a/supplement to airphotos and collateral data for an environmental impact study of the Atchafalaya Basin for the New Orleans engineer district. This single overall inventory permitted a systematic approach and substantial economy for a number of engineering projects for which environmental impact statements would be required. The study area covered approximately 25,000 square miles and included all or part of 36 parishes in Louisiana and 8 counties in Mississippi. It was concluded that as a supplementary source, used in conjunction with airphotos, ERTS had proven itself as a significant means of economy. As a primary source, the Engineer Agency is not yet ready to accept ERTS for their own particular applications. A.L.

**N74-30750\*** Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).

### **THE INFLUENCE OF SEASONAL FACTORS ON THE RECOGNITION OF SURFACE LITHOLOGIES FROM ERTS-IMAGERY OF THE WESTERN TRANSVAAL**

Jan Grootenboer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 643-655 ref

(Paper-G4) CSCL 08G

The value to geological studies of repetitive ERTS-imagery was investigated by comparing two images gathered during different seasons over an area in the western Transvaal Province of the Republic of South Africa. The first of the two images (1050-07355) was gathered on September 11th., 1972, co-inciding with the end of the dry winter season. The second image (1158-07363) was gathered in the middle of the summer rainfall season on December 28th., 1972. A comparison of the two images reveals striking differences in the amount of recognizable geological detail. The differences exhibited by the two images clearly demonstrate the importance of repetitive ERTS coverage in geological investigations, particularly in areas of marked seasonal variations. Author

**N74-30756\*** Alaska Univ., College. Geophysical Inst. **ERTS-1, EARTHQUAKES, AND TECTONIC EVOLUTION IN ALASKA**

Larry Gedney and James VanWormer *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 745-756 refs

(Paper-G10) CSCL 08K

In comparing seismicity patterns in Alaska with ERTS-1 imagery, it is striking to see the frequency with which earthquake epicenters fall on, or near, lineaments visible on the imagery. Often these lineaments prove to be tectonic faults which have been mapped in the field. But equally as often, existing geologic and tectonic maps show no evidence of these features. The



remoteness and inaccessibility of most of Alaska is responsible, in large part, for the inadequacy of the mapping. ERTS-1 imagery is filling a vital need in providing much of the missing information, and is pointing out many areas of potential earthquake hazard. Earthquakes in central and south-central Alaska result when the northeastern corner of the north Pacific lithospheric plate underthrusts the continent. North of Mt. McKinley, the seismicity is continental in nature and of shallow origin, with earthquakes occurring on lineaments, and frequently at intersections of lineaments. The shallower events tend to align themselves with lineaments visible on the imagery. Author

**N74-30763\*** Geological Survey, Reston, Va.  
**PRELIMINARY ROAD ALINEMENT THROUGH THE GREAT KAVIR IN IRAN BY REPETITIVE ERTS-1 COVERAGE**  
 Daniel B. Krinsley / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 823

(Paper-G18) CSCL 08B

Access to the Great Kavir is generally limited to the period August through October when some salt crusts will support limited vehicular movement. The condition of the salt crusts and their parent sediments during the long wet season have been unknown. This absence of information about the surface of the Great Kavir has prevented an intensive study of a possible road alignment which could shorten the present route between northern and central Iran by 760 km. False color diazo composites of bands 4, 5, and 7 were prepared from positives of ERTS-1 MSS images taken of the Great Kavir. These scenes presented a record of the seasonal hydrologic changes that occurred from the dry to the wet season. During the period of maximum inundation and lowest bearing strengths, as inferred from the image of May 12, 1973, it was possible to select a preliminary road alignment that would avoid the wettest or roughest areas and take advantage of the best terrain and shortest distance. The eventual road alignment should be based on a longer record of observation and on-site investigations. Author

**N74-30765\*** Gregory Geoscience Ltd., Ottawa (Ontario).  
**A STUDY OF THE TEMPORAL CHANGES RECORDED BY ERTS AND THEIR GEOLOGICAL SIGNIFICANCE**  
 Harold D. Moore and Alan F. Gregory / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 845-855 refs  
 (Paper-G20) CSCL 08G

The temporal changes that are recorded by ERTS were evaluated for an area around Bathurst Inlet in the North West Territories. The seasons represented by the images included: early winter, spring, early summer, summer, and fall. Numerous surface characteristics (vegetation, drainage patterns, surface texture, lineament systems and topographic relief, etc.) were used to relate the change in observable features with the different seasons. It was found that the time of year when an observation is made has a strong control over the amount and type of information that can be derived by an experienced interpreter. It was concluded that a detailed study of temporal changes is an important part of any ERTS interpretation for geology. Author

**N74-30767\*** Ministry of Public Works, Caracas (Venezuela). Directorate of Urban Planning.  
**ALTITUDE DETERMINATION AND DESCRIPTIVE ANALYSIS OF CLOUDS ON ERTS-1 MULTISPECTRAL PHOTOGRAPHY**  
 Carlos Albrizzio and Adelina Andressen / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 869-882 refs  
 (Paper-G22) CSCL 14E

A simple method to determine the approximate altitude of clouds is described, with the objective of refining their classification using only marginal data from the photographs. Results of

the application of this method on photographs of the Goajira Peninsula, Paraguana Peninsula and the Central Coast of Venezuela are presented. Here, the altitudes computed are used to classify clouds and to identify the genus of others without typical form. Instability of air masses through clouds vertical development, and wind direction as well as other local climatic characteristics such as moisture content, loci of condensation, area, etc. are determined using repetitive coverage for the time interval of the photography. Applications for the regional and urban planning (including airport location and flights schedule) and natural resources evaluation are suggested. Author

**N74-30803\*** Wisconsin Univ., Milwaukee. Coll. of Engineering and Applied Science.  
**THE USE OF ERTS-1 IMAGERY IN AIR POLLUTION AND MESOMETEOROLOGICAL STUDIES AROUND THE GREAT LAKES**  
 Walter A. Lyons and Richard A. Northouse / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1491-1504 refs Sponsored in part by NASA

(Grants EPA-R800873; NSF GA-32208)

(Paper-E1) CSCL 04B

ERTS-1 images continue to be highly useful in studies of: (1) long range transport of air pollutants over the Great Lakes; (2) the mesoscale atmospheric dynamics associated with episodic levels of photochemical smog along the western shore of Lake Michigan; and (3) inadvertent weather modification by large industrial complexes. Also unusual wave patterns in fogs and low stratus over the Great Lakes are being detected for the first time due to the satellites high resolution. Author

**N74-30804\*** Science Applications, Inc., La Jolla, Calif.  
**A METHOD TO MEASURE THE ATMOSPHERIC AEROSOL CONTENT USING ERTS-1 DATA**  
 Michael Griggs / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1505-1517 refs

(Paper-E2) CSCL 04B

The apparent gradual increase of particles in the atmosphere has received considerable attention in recent years due to the possible effect of atmospheric aerosols on the earth's climate. The ERTS-1 satellite offered the opportunity of determining the feasibility of monitoring the atmospheric aerosol content on a global basis, as suggested by theoretical studies, which showed a linear relationship between the upwelling earth atmosphere radiance and the aerosol content. This relationship was investigated at two test sites, San Diego and the Salton Sea, using the MSS radiance data, with ground truth observations of the aerosol content being made with a Volz photometer at the time of the satellite overpasses. Significant results, relating the radiance over water surfaces to the atmospheric aerosol content, have been obtained. The results indicate that the MSS channels, 4, 5 and 6 centered at 0.55, 0.65 and 0.75 micron have comparable sensitivity, and that the aerosol content can be determined within + or - 10% with the assumed measurement errors of the MSS. Author

**N74-30807\*** Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).  
**ERTS IMAGERY AS A SOURCE OF ENVIRONMENTAL INFORMATION FOR SOUTHERN AFRICA**  
 Douglas T. Williamson and Brian Gilbertson / In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1559-1567 refs  
 (Paper-E5) CSCL 08B

Southern Africa is faced with a variety of environmental problems that reflect the different states of development of countries in the region. The task of the environmental planner is in many instances complicated by a lack of basic resource information. The acquisition of the necessary data is often impeded

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by shortage of trained personnel and lack of funds, particularly in developing nations of the region. The range of environmental problems in Southern Africa are described and specific examples are shown of how ERTS type imagery can materially assist in solving these problems. These examples demonstrate that ERTS type data will be of substantial value to both the industrialized and the developing nations of Southern Africa, provided that problems of availability and user education are overcome.

Author

**N74-30808\*** Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).

### **APPLICATION OF ERTS IMAGERY IN ESTIMATING THE ENVIRONMENTAL IMPACT OF A FREEWAY THROUGH THE KNYSNA AREA OF SOUTH AFRICA**

Douglas T. Williamson and Brian Gilbertson / *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1569-1573

(Paper-E6) CSCL 13B

In the coastal areas north-east and south-west of Knysna, South Africa lie natural forests, lakes and lagoons highly regarded by many for their aesthetic and ecological richness. A freeway construction project has given rise to fears of the degradation or destruction of these natural features. The possibility was investigated of using ERTS imagery to estimate the environmental impact of the freeway and found that: (1) All threatened features could readily be identified on the imagery. (2) It was possible within a short time to provide an area estimate of damage to indigenous forest. (3) In several important respects the imagery has advantages over maps and aerial photos for this type of work. (4) The imagery will enable monitoring of the actual environmental impact of the freeway when completed.

Author

**N74-30811\*** Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

### **AIRCRAFT AND SATELLITE MONITORING OF WATER QUALITY IN LAKE SUPERIOR NEAR DULUTH**

James P Scherz, Michael Sydor (Minn. Univ., Duluth), and John F. VanDomelen / *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1619-1636 refs

(Paper-E9) CSCL 08H

Satellite images and low altitude aerial photographs often show vivid discolorations in water bodies. Extensive laboratory analysis shows that water reflectance, which causes brightness on aerial images, positively correlates to the water quality parameter of turbidity, which on a particular day correlates to suspended solids. Work with low altitude photography on three overcast days and with ERTS images on five clear days provides positive correlation of image brightness to the high turbidity and solids which are present in Lake Superior near Duluth over 50% of the time. Proper use of aerial images would have shown that an \$8,000,000 drinking water intake constructed in the midst of this unpotable, turbid water should have been located 6 miles north in clear, usable water. Noise effects such as skylight reflection, atmospheric effects, and depth penetration also must be understood for operational use of remote sensing for water quality monitoring and are considered in the paper.

Author

**N74-30812\*** Kansas Univ., Lawrence.

### **QUANTITATIVE WATER QUALITY WITH ERTS-1**

Harold L. Yarger, James R. McCauley, Gerard W. James, Larry M. Magnuson, and G. Richard Marzolf (Kansas State Univ.) / *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1637-1651 refs

(Contract NAS5-21822)

(Paper-E10) CSCL 08H

Analyses of ERTS-1 MSS computer compatible tapes of reservoir scenes in Kansas along with ground truth show that

MSS bands and band ratios can be used for reliable prediction of suspended loads up to at least 900 ppm. The major reservoirs in Kansas, as well as in other Great Plains states, are playing increasingly important roles in flood control, recreation, agriculture, and urban water supply. Satellite imagery is proving useful for acquiring timely low cost water quality data required for optimum management of these fresh water resources.

Author

**N74-30827\*** Alaska Univ., Fairbanks.

### **APPLICATIONS OF ERTS DATA TO RESOURCE SURVEYS OF ALASKA**

Albert E. Belon and John M. Miller / *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1899-1907

(Paper-113) CSCL 08F

ERTS data affords a unique opportunity to perform urgently needed resource surveys and land use planning at a critical juncture in the history of Alaska's social and economic development. The available facilities for photographic, optical and digital processing of ERTS data are described, along with the interpretive techniques which have been developed. Examples of the applications of these facilities and techniques are given for three environmental disciplines: vegetation mapping for potential archeological sites; marine and sea ice surveys on the Alaskan continental shelf for the determination of surface circulation and sedimentation patterns and their effects on navigation, pollution assessment, fisheries, location of harbors and construction of off-shore structures, snow surveys for inventories of water resources and flood potential in Alaska watersheds.

Author

**N74-30844#** Joint Publications Research Service, Arlington, Va.

### **THE EARTH'S FUTURE AND RESEARCH AT PUSHCHINO CITY**

N. Moiseyev and L. Repetskiy 1 Jul. 1974 22 p refs Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 98-111

(JPRS-62356) Avail: NTIS HC \$4.25

The future of the planet earth, systems analysis, and scientific projects at the Pushchino Biological Study Center are discussed.

**N74-30845** Joint Publications Research Service, Arlington, Va.

**FUTURE OF THE PLANET AND SYSTEMS ANALYSIS**  
N. Moiseyev / *In* its The Earth's Future and Res. at Pushchino City (JPRS-62356) 1 Jul. 1974 p 1-12 refs Transl. into ENGLISH from Nauka Zhizn (USSR), no. 4, 1974 p 98-104

The environmental evolution of the earth is discussed. Research and procedures are described which are essential to solving the problem of using national resources rationally and protecting the environment. Models are proposed for biogeocenoses, energy balance, human productive capacity, and world economy.

E.J.O.

**N74-30875#** Commissariat a l'Energie Atomique, Grenoble (France).

### **MEASUREMENT OF THE DYNAMIC CHARACTERISTICS OF ATMOSPHERIC DIFFUSION** Ph.D. Thesis - Univ. Scientifique et Medicale de Grenoble, France

F. Rigot-Muller Jan. 1974 68 p refs In FRENCH (CEA-R-4501) Avail: AEC Depository Libraries HC \$5.50

A method is proposed for studying the diffusion of atmospheric pollutants above real sites, which considers the actual magnitudes encountered. In view of justifying the method, fundamental theories concerning diffusion are presented together with different models for the atmosphere. The atmosphere is then considered as a linear filter to which the process identification method is applied. The pulse response of the filter is examined

in the pollutant-time plane. The limits of the method and its field of application are discussed. The concepts of ergodism and stationarity are introduced. Various diffusion experiments carried out under different conditions are reviewed. Information on the effect of obstacles and the roughness of the ground is given together with calculations on the longitudinal diffusion and the transport velocity. Author (NSA)

**N74-30905#** Allied Chemical Corp., Idaho Falls, Idaho.  
**STACK MONITOR SYSTEM AT THE IDAHO CHEMICAL PROCESSING PLANT**

R. C. Gorton, L. T. Lakey, and D. T. Pence Sep. 1973 30 p refs

(Contract AT(10-1)-1375)

(ICP-1034) Avail: NTIS HC \$4.00

The effluent monitoring system used to measure airborne particulate emissions from the Idaho chemical processing plant is described in detail. The efficiency of the system has been evaluated through studies of particle migration as a function of size, particulate plateau, particle size distribution, type of filter paper, flow rates, and the homogeneity of the gaseous effluents. Several deficiencies of the system have been identified and recommendations for improvement to meet present and anticipated pollution regulations are presented. Author (NSA)

**N74-31128#** Mitre Corp., McLean, Va.  
**FIXED VS. VARIABLE ENVIRONMENTAL STANDARDS**  
**Interim Report**

Robert P. Pikul May 1973 44 p refs

(Contract EPA-68-01-1849)

(PB-221878/2; M73-53) Avail: NTIS CSCL 13B

The established nature and enforcement of environmental standards will have a far reaching impact on future socio-economic-environmental characteristics of geographical areas, availability and cost of energy, revitalization of urban areas and overall quality of life. The purpose of the paper is to provide a frame of reference for discussion of fixed vs. variable standards and to generally explore some potential social and economic consequences of allowing variable standards. It is shown that effluent or emission standards particularly, exhibit both fixed as well as variable properties based on parameters such as time, geographical area and source category. Present variability in standards generally results from independent analyses of individual pollutants and individual source categories. The implications of variable standards are discussed within the context of the air pollution problem as a specific illustration. Author (GRA)

**N74-31790\*#** Earth Satellite Corp., Washington, D.C.  
**LAND USE STUDIES WITH SKYLAB DATA, AUGUST 1974**  
**Interim Report, Aug. 1974**

David S. Simonett, Principal Investigator and Wayne G. Rohde Aug. 1974 61 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP (Contract NAS9-13314)

(E74-10709; NASA-CR-139542) Avail: NTIS HC \$6.25 CSCL 08B

The author has identified the following significant results. Capabilities of Skylab photographic data suggest significant applications for: (1) identification and mapping of all primary, most secondary, and many tertiary land use classes; (2) stratification of the landscape for more detailed sampling; and (3) rapid updating of existing land use and vegetation maps subscaled at 1:25,000 and smaller with manual interpretation techniques. Automated thematic mapping of land use categories with electronic data processing techniques is feasible with the S-192 multispectral scanner, despite the high noise levels in many channels.

**N74-31802\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY** Monthly Progress Report, Jul. 1974

Irvin J. Sattinger, Principal Investigator 13 Aug. 1974 2 p EREP

(Contract NAS9-13283)

(E74-10731; NASA-CR-139577; ERIM-103300-31-L) Avail: NTIS HC \$4.00 CSCL 08B

**N74-31940#** National Environmental Research Center, Research Triangle Park, N.C. Chemistry and Physics Lab.

**PERFORMANCE SPECIFICATIONS FOR STATIONARY SOURCE MONITORING SYSTEMS FOR GASES AND VISIBLE EMISSIONS**

John S. Nader, Frederic Jayé, and William Conner Jan. 1974 77 p refs

(PB-230934/2; EPA-650/2-74-013) Avail: NTIS HC \$7.00 CSCL 13B

This report provides a technical basis for the selection of stationary-source monitors that are required by Federal, State, or local regulations for emissions. The document identifies performance parameters, gives specifications and details test procedures to verify the specifications. Examples of the specifications and test procedures are provided for monitoring systems applied to gases and visible emissions. Technical data used for the specifications are based on the results of laboratory and field studies. GRA

**N74-32057#** Commissariat à l'Energie Atomique, Grenoble (France).

**MEASUREMENTS OF POLLUTION IN THE LOWER LAYERS OF THE ATMOSPHERE**

P. Perroud, M. Sylvestre-Baron, G. Pleyber, P. Perilhon, R. Faivre-Pierret, A. Closson, and C. Nicotra Jun. 1973 23 p In FRENCH Presented at the Meeting of Anti-pollution Tech., Grenoble, France, 2-6 Oct. 1973

(CEA-Conf-2487; Conf-731050-1) Avail: AEC Depository Libraries HC \$3.25

The measurement of the meteorological parameters and the sampling of pollutants in the lower levels of the atmosphere were made by the use of captive balloons. A 550 M 3 airship filled with hydrogen was used with apparatus distributed along the anchor cable up to a height of 1,200 m. The meteorological probes used to measure the pressure, temperature, humidity, and wind velocity and to transmit them to the ground are described. The apparatus for air sampling and the chemical analytical methods are described. The results obtained are reported. This experiment made it possible to prove the relations existing between temperature inversion regions and pollution levels. The results show that under the temperature emission layers the profiles for the diffusion of SO<sub>2</sub>, Cl<sub>2</sub>, and organic pollutants are sharply different. Author (NSA)

**N74-32058#** Commissariat à l'Energie Atomique, Grenoble (France).

**USE OF CAPTIVE BALLOONS FOR THE STUDY OF THE POLLUTION IN THE LOWER LAYERS OF THE ATMOSPHERE**

P. Perroud, G. Pleyber, and M. Sylvestre-Baron Sep. 1973 15 p In FRENCH Presented at the AERALL Colloq., Paris, 12-14 Nov. 1973

(CEA-Conf-2491; Conf-731138-1) Avail: AEC Depository Libraries HC \$3.00

The sampling of pollutants is made with the aid of devices suspended to the anchor cable of a captive balloon. A radio-probe gives the vertical profile of the pressure, the temperature, and the humidity of the air and the vertical profile of the wind velocity.

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The start-up of the device is described. Some results are given which show the influence of a temperature inversion layer on the diffusion of certain pollutants. Author (NSA)

**N74-32760\*#** Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.  
**AUTOMATIC PHOTOINTERPRETATION FOR LAND USE MANAGEMENT IN MINNESOTA Final Report**  
G. D. Swanlund, Principal Investigator, L. Kirvida, M. Cheung, D. Pile, and R. Zirkle 21 Jun. 1974 65 p Original contains color illustrations ERTS  
(Contract NAS5-21742)  
(E74-10687; NASA-CR-139220) Avail: NTIS HC \$6.25 CSCL 08B

The author has identified the following significant results. Automatic photointerpretation techniques were utilized to evaluate the feasibility of data for land use management. It was shown that ERTS-1 MSS data can produce thematic maps of adequate resolution and accuracy to update land use maps. In particular, five typical land use areas were mapped with classification accuracies ranging from 77% to over 90%.

**N74-32764\*#** Kansas Univ., Lawrence.  
**SKYLAB STUDY OF WATER QUALITY Progress Report, Jun. - Aug. 1974**  
Harold L. Yarger, Principal Investigator and James R. McCauley Aug. 1974 10 p refs EREP  
(Contract NAS9-13271)  
(E74-10735; NASA-CR-139625) Avail: NTIS HC \$4.00 CSCL 08H

The author has identified the following significant results. Analysis of S-190A imagery from 1 EREP pass over 3 reservoirs in Kansas establishes a strong linear correlation between the red/green radiance ratio and suspended solids. This result compares quite favorably to ERTS MSS CCT results. The linear fits RMS for Skylab is 6 ppm as compared to 12 ppm for ERTS. All of the ERTS satellite passes yielded fairly linear results with typical RMS values of 12 ppm. However, a few of the individual passes did yield RMS values of 5 or 6 ppm which is comparable to the one Skylab pass analyzed. In view of the cloudy conditions in the Skylab photos, yet good results, the indications are that S-190A may do somewhat better than the ERTS MSS in determining suspended load. More S-190A data is needed to confirm this. As was the case with the ERTS MSS, the Skylab S-190A showed no strong correlation with other water quality parameters. S-190B photos because of their high resolution can provide much first look information regarding relative degrees of turbidity within various parts of large lakes and among smaller bodies of water.

**N74-32765\*#** Corps of Engineers, Waltham, Mass.  
**NEW ENGLAND RESERVOIR MANAGEMENT Quarterly Progress Report, 23 Apr. - 23 Jul. 1974**  
Saul Cooper and Duwayne Anderson, Principal Investigators. (CRREL) 23 Jul. 1974 5 p EREP  
(NASA Order T-4646-B)  
(E74-10736; NASA-CR-139626; QPR-5) Avail: NTIS HC \$4.00 CSCL 08H

**N74-32771\*#** Delaware Univ., Newark. College of Marine Studies.  
**SKYLAB AND ERTS-1 INVESTIGATIONS OF COASTAL LAND USE AND WATER PROPERTIES**  
V. Klemas, Principal Investigator, D. Bartlett, and R. Rogers (Bendix Corp., Ann Arbor, Mich.) 17 Sep. 1974 2 p ERTS  
(Contracts NAS5-21837; NAS1-12304)  
(E74-10745; NASA-CR-139985) Avail: NTIS HC \$4.00 CSCL 08B

The author has identified the following significant results. ERTS-1 multispectral scanner and Skylab's S190A, S190B, and S192 data products were evaluated for their utility in studying

current circulation, suspended sediment concentrations and pollution dispersal in Delaware Bay and in mapping coastal vegetation and land use. Imagery from the ERTS-1 MSS, S190A and S190B cameras shows considerable detail in water structure, circulation, suspended sediment distribution and within waste disposal plumes in shelf waters. These data products were also used in differentiating and mapping twelve coastal vegetation and land use classes. The spatial resolution of the S190A multispectral facility appears to be about 30 to 70 meters while that of the S190B earth terrain camera is about 10 to 30 meters. Such resolution, along with good cartographic quality, indicates a considerable potential for mapping coastal land use and monitoring water properties in estuaries and on the continental shelf. The ERTS-1 MSS has a resolution of about 70-100 meters. Moreover, its regular 18-day cycle permits observation of important changes, including the environmental impact of coastal zone development on coastal vegetation and ecology.

**N74-32774\*#** Kansas Univ., Lawrence.  
**SKYLAB STUDY OF WATER QUALITY Progress Report, Mar. - May 1974**  
Harold L. Yarger, Principal Investigator and James R. McCauley May 1974 4 p EREP  
(Contract NAS9-13271)  
(E74-10748; NASA-CR-139988) Avail: NTIS HC \$4.00 CSCL 08H

**N74-33094#** General Dynamics/Convair, San Diego, Calif.  
**REMOTE SENSING OF AIR POLLUTION IN URBAN AREAS Environmental Protection Technology Series.**  
M. L. Streiff and C. B. Ludwig Aug. 1973 184 p refs  
(Contract EPA-68-02-0020)  
(PB-230885/6; EPA-650/2-73-026) Avail: NTIS HC \$12.25 CSCL 13B

Remote sensing of air pollution was made using a scanning spectrometer (ROSE system) and a Michelson interferometer. Both systems were for transmission measurements over nominal path lengths of one and two miles and for stack emission measurements. A comparison shows that the spectra of both instruments are of the same quality. A comparison of both instruments is made and the advantages and disadvantages are cited. The ROSE system alone was used to measure the pollution from an extended source (oil refinery) over a path length of 1.4 mile. All of the spectra were analyzed and a number of pollutants were identified. Author (GRA)

**N74-33347#** European Space Research Organization, Paris (France).  
**THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. 3: ATMOSPHERIC SCIENCES**  
1973 233 p refs Proc. of the ESRO Summer School 1973 4 Vol.  
Avail: NTIS HC \$14.75

Atmospheric science topics, including atmospheric pollution, climate, composition of mesosphere and thermosphere, remote sounding, environmental parameters and laser sounding are presented. The use of spacelab for studying the earth's atmosphere is discussed.

ESRO

**N74-33349** Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.  
**SPECTRAL SIGNATURES OF MINOR ATMOSPHERIC CONSTITUENTS AND EXPERIMENTAL POSSIBILITIES TO USE THEM FOR POLLUTION MONITORING**  
H. J. Bolle In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 100 p refs

The occurrence of minor constituents in the earth's atmosphere and methods of using them for air pollution monitoring are discussed. The nature of the spectral signatures of gases is

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dealt with, and principles of quantitative gas-constituent observation are detailed. Observation techniques include emission measurement, absorption in reflected and scattered sunlight, and occultation and application of artificial sources. Detection of the following gaseous components is discussed: carbon dioxide, water, ozone and oxidants, carbon monoxide, nitrogen compounds, sulfur compounds, alkyl free radicals, and hydrocarbons and their oxidized derivatives. ESRO

**N74-33825\*#** Geological Survey, Reston, Va.  
**SELECTED APPLICATIONS OF SKYLAB HIGH-RESOLUTION PHOTOGRAPHY TO URBAN AREA LAND USE ANALYSIS**  
**Interim Report**  
Robert H. Alexander, Principal Investigator and Harry F. Lins, Jr. 15 Aug. 1974 39 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP  
(NASA Order T-5290-B)  
(E74-10757; NASA-CR-139997) Avail: NTIS HC \$5.00 CSCI 14E

**N74-33826\*#** Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.  
**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES** Progress Report, 1 Aug. - 31 Aug. 1974  
Ernest E. Hardy, Principal Investigator 31 Aug. 1974 2 p EREP  
(Contract NAS9-13364)  
(E74-10759; NASA-CR-139999) Avail: NTIS HC \$4.00 CSCI 08B

**N74-33827\*#** Imperial Government of Iran, Tehran.  
**AN EVALUATION OF THE UTILITY OF ERTS-1 DATA FOR MAPPING AND DEVELOPING NATURAL RESOURCES OF IRAN** Interim Report, Jan. - Jun. 1973  
K. Ebtehadj, Principal Investigator Jul. 1973 71 p refs Sponsored by NASA Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(E74-10760; NASA-CR-140000) Avail: NTIS HC \$6.75 CSCI 08F

The author has identified the following significant results. Significant results are reported in the creation of an Iranian photomosaic from ERTS-1 imagery; in tectonic and structural mapping and interpretation, including discovery of significant new fault patterns in Iran; in river and lake mapping; in wetlands and fisheries nursery delineation and mapping; in range and agricultural surveys and inventories using multi-stage sample methods; and in the computer analysis of ERTS-1 digital tapes for urban land use.

**N74-33830\*#** National Aeronautics and Space Administration, John F. Kennedy Space Center, Cocoa Beach, Fla.  
**PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA** Quarterly Progress Report, 1 May - 31 Jul. 1974  
John W. Hannah, Principal Investigator (Brevard County Planning Dept., Titusville, Fla.), Garland L. Thomas (Brevard County Planning Dept., Titusville, Fla.), Fernando Esparza, and Homer Royals (Florida Game and Fresh Water Fish Comm., Eustis) 1 Aug. 1974 12 p EREP  
(E74-10763; NASA-TM-X-70355) Avail: NTIS HC \$4.00 CSCI 08B

**N74-33833\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

### **EVALUATION OF SKYLAB DATA FOR LAND USE MAPPING** **Progress Report, Aug. 1974**

LeRoy Silva, Principal Investigator Aug. 1974 1 p EREP  
(Contract NAS9-13301)  
(E74-10766; NASA-CR-140006) Avail: NTIS HC \$4.00 CSCI 08B

### **N74-33836\*#** Mitre Corp., McLean, Va. **AN AIRBORNE REMOTE SENSING SYSTEM FOR URBAN AIR QUALITY**

L. J. Duncan, E. J. Friedman, E. L. Keitz, and E. A. Ward Feb. 1974 279 p refs Sponsored by NASA  
(Contract F19628-73-C-001; Proj. 8190)  
(NASA-CR-132499; MTR-6601) Avail: NTIS HC \$6.75 CSCI 13B

Several NASA sponsored remote sensors and possible airborne platforms were evaluated. Outputs of dispersion models for SO<sub>2</sub> and CO pollution in the Washington, D.C. area were used with ground station data to establish the expected performance and limitations of the remote sensors. Aircraft/sensor support requirements are discussed. A method of optimum flight plan determination was made. Cost trade offs were performed. Conclusions about the implementation of various instrument packages as parts of a comprehensive air quality monitoring system in Washington are presented. Author

### **N74-33857\*#** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div. **REMOTE SENSING IN MICHIGAN FOR LAND RESOURCE MANAGEMENT** Annual Report, 1 Jun. 1973 - 31 May 1974

D. S. Lowe, L. B. Istvan, N. E. Roller, I. J. Sattinger, A. N. Sellman, and T. W. Wagner Sep. 1974 58 p refs  
(Grant NGR-23-005-552)  
(NASA-CR-140115; ERIM-193400-5-P) Avail: NTIS HC \$6.00 CSCI 08B

The application of NASA earth resource survey technology to resource management and environmental protection in Michigan was investigated. Remote sensing techniques to aid Michigan government agencies were applied in the following activities: (1) land use inventory and management, (2) great lakes shorelands protection and management, (3) wetlands protection and management, and (4) soil survey. In addition, information was disseminated on remote sensing technology, and advice and assistance was provided to a number of users. Author

### **N74-33879\*#** National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va. **ENVIRONMENT SURVEYS**

Lawrence R. Greenwood In its 3rd ERTS Symp., Vol. 3 May 1974 p 107-122 refs  
CSCI 08B

Environment applications are concerned with the quality, protection, and improvement of water, land, and air resources and, in particular, with the pollution of these resources caused by man and his works, as well as changes to the resources due to natural phenomena (for example, drought and floods). The broad NASA objectives related to the environment are directed toward the development and demonstration of the capability to monitor remotely and assess environmental conditions related to water quality, land and vegetation quality, wildlife resources, and general environment. The contributions of ERTS-1 to these subdiscipline areas are broadly summarized. Author

### **N74-33949\*#** Stanford Univ., Calif. Microwave Lab. **INFRARED DIFFERENTIAL ABSORPTION FOR ATMOSPHERIC POLLUTANT DETECTION** Semiannual Report, Mar. - Sep. 1974

R. L. Byer Oct. 1974 104 p refs  
(Grant NSG-1012)  
(NASA-CR-140400; ML-2357) Avail: NTIS HC \$8.25 CSCI 14B

Progress made in the generation of tunable infrared radiation

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and its application to remote pollutant detection by the differential absorption method are summarized. It is recognized that future remote pollutant measurements depended critically on the availability of high energy tunable transmitters. Furthermore, due to eye safety requirements, the transmitted frequency must lie in the 1.4 micron to 13 micron infrared spectral range. Author

**N74-34019#** Stanford Research Inst., Menlo Park, Calif.  
**FEASIBILITY OF A CW LIDAR TECHNIQUE FOR MEASUREMENT OF PLUME OPACITY** Final Report  
Richard A. Ferguson Nov. 1973 96 p refs  
(Contract EPA-68-02-0543)  
(PB-231992/9; EPA-650/2-73-037) Avail: NTIS HC \$8.00 CSCL 17H

The report describes the work performed to develop an eyesafe CW lidar for remote measurement of the opacity of smoke plumes from industrial smoke stacks. The analysis design construction, and evaluation of a laboratory model CW lidar were performed to determine the limitations and potential of the technique. The proof-of-principle experiments combine what is called FM-CW radar technique with an argon laser. The technique involves modulating the intensity of the laser beam at a frequency that changes rapidly and linearly with time. A portion of the transmitted signal is mixed electronically with the light reflected from the targets in a device similar to a radio receiver. Each target appears at a particular frequency. By tuning the radar's receiver to these target frequencies, the researchers were able to measure both the range and the opacity of semitransparent targets over distances of 100 to 200 meters. GRA

**N74-34141#** Army Edgewood Arsenal, Md.  
**AIR POLLUTION FIELD STUDIES WITH A RAMAN LIDAR**  
Technical Report, Jan. 1972 - Dec. 1973  
Harry P. DeLong Jun. 1974 17 p refs  
(AD Proj. 186-22401-AD-27)  
(DA-781974; ED-TR-74006) Avail: NTIS CSCL 07/4

Raman lidar techniques have been discussed theoretically and sensitivities for various pollutants have been predicted. The results of the present real Raman Lidar indicates pollutant levels between 40-300 ppm are the present sensitivities but very realistic projections based on these data suggest sensitivities between 0.53-7 ppm could be reached if nondispersive detection techniques were used. Author (GRA)

**N74-34733\*#** Mississippi State Univ., State College.  
**A STUDY FOR THE APPLICATION OF REMOTE SENSING DATA TO LAND USE PLANNING ON THE MISSISSIPPI GULF COAST** Final Report, Sep. 1972 - Aug. 1974  
F. M. Ingels, Principal Investigator, R. W. Boyd, E. Bryant, B. T. Chapin, R. T. Jones, and C. W. Bouchillon Aug. 1974 60 p refs  
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21817)  
(E74-10733; NASA-CR-139623) Avail: NTIS HC \$4.25 CSCL 08B

**N74-34743\*#** Kansas Univ. Center for Research, Inc., Lawrence. Space Technology Center.  
**KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL. MONITORING FRESH WATER RESOURCES** Final Report, 1 Aug. 1972 - 24 Mar. 1974  
Harold L. Yarger, Principal Investigator and James R. McCauley Mar. 1974 60 p refs ERTS  
(Contract NAS5-21822)  
(E74-10776; NASA-CR-140129; Rept-2265-10) Avail: NTIS HC \$6.00 CSCL 08H

The author has identified the following significant results. ERTS MSS ratios derived from CCT's are very effective for quantitative detection of suspended solid up to at least 900 ppm. The relatively high inorganic suspended solids, characteristic of midcontinent reservoirs, dominates the reflected energy present

in the four MSS bands. Dissolved solids concentrations up to 500 ppm and algal nutrients up to 20 ppm are not detectable. The MSS5/MSS4 ratio may be weakly correlated with total chlorophyll above approximately 8 micrograms/liter.

**N74-34744\*#** Cochise County Planning Dept., Bisbee, Ariz.  
**APPLICATION OF REMOTE SENSING TECHNIQUES IN LAND-USE PLANNING: FLOOD-PLAIN DELINEATION**  
Jim Altenstadter, Principal Investigator and Robin B. Clark Sep. 1974 28 p refs  
Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21807)  
(E74-10777; NASA-CR-140130) Avail: NTIS HC \$3.75 CSCL 08B

The delineation of areas subject to inundation by means of remotely-sensed data acquisition represents a considerable saving in personnel time. Repeated input from aerial sensor sources provides the planner with a potent tool for the formation of a data base and for the monitoring of land use patterns over a period of time. The primary output of this project was a set of base map overlays at a scale of 1:62,500 delineating areas which require special regulations when proposed for land use involving human habitation or certain classes of storage. A secondary product of the study was county-wide maps of watershed configurations and of soil hydrologic groups. Further research is anticipated to extend the mapping of watershed areas outside the political boundaries of Cochise County, which will provide data for subsequent rainfall-runoff relationship studies in the area. All of the data provided will be incorporated into the Cochise County composite computer mapping project now operational. Results of this project have improved the pool of information available to the planning staff of Cochise County.

**N74-34753\*#** Dartmouth Coll., Hanover, N.H. Dept. of Geography.  
**INVESTIGATION OF LAND USE OF NORTHERN MEGALOPOLIS USING ERTS-1 IMAGERY** Supplementary Report, 15 Dec. 1973 - 15 Jun. 1974  
Robert B. Simpson, Principal Investigator, David T. Lindgren, and William Goldstein Jul. 1974 54 p  
Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21749)  
(E74-10786; NASA-CR-140139; S113-116) Avail: NTIS HC \$5.75 CSCL 08B

The author has identified the following significant results. It was concluded that ERTS land use mapping, in spite of portraying megalopolis more accurately and dramatically than the best past efforts, is in danger of falling into the category of being too revolutionary for many planners and too conventional for many electronics engineers. Two alternative solutions are implied: one is to improve the ERTS product to the level where it will be completely accepted by planners, and the other is to increase support for the present somewhat primitive product through education, cost-sharing, and legislation.

**N74-34761\*#** Environmental Research Inst. of Michigan, Ann Arbor.  
**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY** Monthly Progress Report  
Irvin J. Sattinger, Principal Investigator 15 Sep. 1974 2 p EREP  
(Contract NAS9-13283)  
(E74-10794; NASA-CR-140147; ERIM-103300-33-L) Avail: NTIS HC \$3.25 CSCL 08B

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**N74-34790\*** # South Dakota State Univ., Brookings. Remote Sensing Inst.

**USE OF REMOTE SENSING TECHNIQUES FOR INVENTORING AND PLANNING UTILIZATION OF LAND RESOURCES IN SOUTH DAKOTA Annual Progress Report. Jul. 1973 - Jun. 1974**

V. I. Myers, C. J. Frazee, A. E. Rusche, D. G. Moore, G. D. Nelson, and F. C. Westin Jun. 1974 96 p refs Original contains color illustrations

(Grant NGL-42-003-007)

(NASA-CR-140574; SDSU-RSI-74-08) Avail: NTIS HC \$8.00 CSCL 08B

The basic procedures for interpreting remote sensing imagery to rapidly develop general soils and land use inventories were developed and utilized in Pennington County, South Dakota. These procedures and remote sensing data products were illustrated and explained to many user groups, some of whom are interested in obtaining similar data. The general soils data were integrated with land soils data supplied by the county director of equalization to prepare a land value map. A computer print-out of this map indicating a land value for each quarter section is being used in tax reappraisal of Pennington County. The land use data provided the land use planners with the present use of land in Pennington County. Additional uses of remote sensing applications are also discussed including tornado damage assessment, hail damage evaluation, and presentation of soil and land value information on base maps assembled from ERTS-1 imagery.

Author

Yu. A. Izrael *In its Meteorol. and Hydrol.*, No. 7, 1974 (JPRS-63109) 2 Oct. 1974 p 1-8 ref Transl. into ENGLISH from *Meteorol. Gidrol.* (Moscow), no. 7, 1974 p 3-8

A basis is presented for a global observation (monitoring) system. The system includes observations of the condition of the environment and also observations of the response of the biota caused by variation of this condition. Forecasting and evaluating the existing and predicted state of the environment make it possible to isolate the anthropogenic changes and optimize the human relations to the environment.

Author

**N74-34817\*** # Ambionics, Inc., Washington, D.C.

**REMOTE SENSING OF COAL MINE POLLUTION IN THE UPPER POTOMAC RIVER BASIN Final Report**

[1974] 70 p refs Sponsored in part by EPA

(Contract NAS1-12673)

(NASA-CR-132529) Avail: NTIS HC \$6.50 CSCL 08H

A survey of remote sensing data pertinent to locating and monitoring sources of pollution resulting from surface and shaft mining operations was conducted in order to determine the various methods by which ERTS and aircraft remote sensing data can be used as a replacement for, or a supplement to traditional methods of monitoring coal mine pollution of the upper Potomac Basin. The gathering and analysis of representative samples of the raw and processed data obtained during the survey are described, along with plans to demonstrate and optimize the data collection processes.

Author

**N74-35015** Stockholm Electricity Board (Sweden).

**MATHEMATICAL SYSTEM FOR CALCULATIONS OF SPREAD OF AIR POLLUTION IN THE GREATER STOCKHOLM AREA**

Bjoern Bringfelt and Olof Wikstroem *In NATO Comm. on the Challenges of Mod. Soc. Proc. of the 3d Meeting of the Expert Panel on Air Pollution Modeling* 3 Oct. 1972 17 p

An air pollution model is reported that is based on the Gaussian plume dispersion concept. It is essentially a short term model from which could be calculated the frequency distribution for the SO<sub>2</sub> concentration occurring at arbitrary receptor locations over an extended period of time. Initial tests of the model have given quite good agreement with the observed frequency distributions, and both calculated and observed distributions were close to logarithmic normal.

Author

**N74-35047** Joint Publications Research Service, Arlington, Va.  
**GLOBAL OBSERVATION SYSTEM. FORECASTING AND EVALUATING CHANGES IN THE STATE OF THE ENVIRONMENT. FUNDAMENTALS OF MONITORING**

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## GEODESY AND CARTOGRAPHY

Includes mapping and topography.

**A74-38634** Space oblique mercator. A. P. Colvocoresses (U.S. Geological Survey, Reston, Va.). *Photogrammetric Engineering*, vol. 40, Aug. 1974, p. 921-926. 10 refs.

The Earth Resources Technology Satellite (ERTS) Multispectral Scanner (MSS) is producing imagery of high geometric fidelity. The positional errors of points on a properly controlled image are less than the 80-m instantaneous field of view (picture element) of the scanner. Such accuracy is attributed to the stability of the scanner and spacecraft and to the corrections that are being made by NASA before each image is printed. The image is in fact formed on a cylindrical surface in space which can be defined as a specific map projection and results in the mapping of the world (between the 82 deg parallels) every 18 days. Moreover the projection is mathematically definable and thus has the potential of developing into an automated mapping system in which the picture element (pixel) can be discretely related to its position on the figure of the earth. F.R.L.

**A74-39609** Influence of the atmosphere on spectral radiance and contrasts of natural formations measured from space. K. Ia. Kondrat'ev, A. A. Buznikov, O. B. Vasil'ev, and O. I. Smoktii (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). In: *UCLA International Conference on Radiation and Remote Probing of the Atmosphere*, Los Angeles, Calif., August 28-30, 1973, Proceedings. North Hollywood, Calif., Western Periodicals Co., 1974, p. 309-336. 16 refs.

**A74-40123** Plumb line deflection near the North Pole. R. L. Lillestrand (Control Data Corp., Minneapolis, Minn.) and J. R. Weber (Department of Energy, Mines and Resources, Ottawa, Canada). *Journal of Geophysical Research*, vol. 79, Aug. 10, 1974, p. 3347-3352. 10 refs.

The deflection of the plumb line in the vicinity of the Lomonosov ridge near the North Pole was measured from a drifting ice station. The computation is based on the comparison of two drift paths, one determined from astronomical observations, and the other from Transit Satellite observations. The arc vector between an astronomical fix and a satellite fix observed at the same time is the plumb line deflection. Since the station was drifting, continuous deflection measurements were obtained along the drift path. Computed average deflection was 9 arc sec in a direction of 34 E pointing away from the Lomonosov ridge. This is in qualitative agreement with what one would expect from a plausible ridge density distribution based on the assumption of a continental origin of the Lomonosov ridge. P.T.H.

**A74-40998** # The European Datum derived from a comparison of the astro-geodetic and the gravimetric geoid of the Federal Republic of Germany. D. Lelgemann. *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper*. 8 p.

**A74-41697** # Perspectives of studies of the earth's shape and dynamics in the light of new observation techniques (Perspektywy badan figury i dynamiki Ziemi w swietle zastosowania nowych

technik obserwacyjnych). B. Kolaczek. *Geodezja i Kartografia*, vol. 23, no. 3, 1974, p. 171-184. 44 refs. In Polish.

It is shown that with the advent of such techniques as laser and Doppler satellite observations, lunar and satellite laser ranging, and long-base radio interferometry, the shape of the earth and the parameters defining the earth's potential and rotation can be determined within decimeter accuracy. The results of studies of the pole position by Doppler satellite observations, and data on local crustal movements obtained with the aid of long base-chord lengths are examined. V.P.

**A74-41699** # Determination of the earth's gravitational potential by the method of point masses (Okreslenie potencjalu sily ciezkosci Ziemi metoda mas punktowych). W. Dobaczewska. *Geodezja i Kartografia*, vol. 23, no. 3, 1974, p. 239-245. 6 refs. In Polish.

An altimetry method which uses measurements of the distance between a satellite and the ocean level to study the figure of the earth is examined, and the advantages of representing the earth's potential in terms of point masses are evaluated. A model of the earth represented in point masses is shown to permit more meaningful interpretation of geophysical data. V.P.

**A74-42808** The time factor in aerial photography for soil surveys in lowland England. R. Evans (Soil Survey of England and Wales, Cambridge, England). In: *Environmental remote sensing: Applications and achievements; Proceedings of the Symposium*, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 67-86. 8 refs.

This paper deals mainly with panchromatic air photography, as it is the visible part of the electromagnetic spectrum which is most commonly used for interpretation. It is moreover the cheapest form of airborne imagery. For photographs to be of maximum use, factors which complicate interpretation should be eliminated as far as possible; and they should not be taken when the ratio between bare and cropped fields is low, as photographic tone patterns cannot then be traced from field to field without a break. The time of year for recording soil changes, the time of year and time of day for air photography, and color air photography are discussed. F.R.L.

**A74-43596** The earth from space. J. Bodechtel and H.-G. Gierloff-Emden (München, Universität, Munich, West Germany). New York, ARCO Publishing Co., Inc., 1974. 176 p. Translation. \$16.95.

The techniques of space surveys are discussed and a description is given of the special photographic methods employed. Over 40 photographs and nearly 50 diagrams and maps, most of which are reproduced in full color, show the earth in huge sections. The significance of satellites in meteorological research and weather forecasting is considered along with the movements of the earth's crust and the landscape types on earth. Outlines are given of the geology, the prevailing climate, and the land use of many parts of the earth. Specific areas of the earth described include the Sinai Peninsula, the Gulf of Aden, the Plateau of Hadramaut in Southern Arabia, Oman, the Strait of Hormus, the Tigris Plain, Lake Niris in South Iran, a desert landscape in Libya, the Namib desert in South West Africa, and the Tuamotu Atolls in the Pacific Ocean. A number of lunar photographs are also provided. G.R.

**N74-29726\*** # Scientific Translation Service, Santa Barbara, Calif. **A SYSTEM OF CONDITIONAL RELIEF SYMBOLS FOR LUNAR TOPOGRAPHIC MAPS**

### 03 GEODESY AND CARTOGRAPHY

K. B. Shingareva and G. A. Burba Washington NASA Jul. 1974 28 p refs Transl. into ENGLISH of "Sistema Uslovykh Znakov Relyefa dlya Lunnykh Topograficheskikh Planov", Acad. of Sci. USSR, Moscow, report, no. 152, 26 p (Contract NASw-2483) (NASA-TT-F-15676; Rept-152) Avail: NTIS HC \$4.50 CSCL 08B

Principles for the construction of a system of conditional relief symbols for lunar topographic maps are discussed. The system is based on a letter-number scheme of logical connections between relief elements. The possibility of altering the graphical symbols of this system, depending on what is required of the topographic map, is illustrated. Alternatives for designing topographic maps for the Lunokhod-1 are presented. Author

**N74-29729\*** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

#### **THE RELATION OF VARIATIONS IN TOTAL MAGNETIC FIELD AT HIGH LATITUDE WITH THE PARAMETERS OF THE INTERPLANETARY MAGNETIC FIELD AND WITH DP2 FLUCTUATIONS**

R. A. Langel Jun. 1974 34 p refs Submitted for publication (NASA-TM-X-70711; X-922-74-189) Avail: NTIS HC \$4.75 CSCL 20J

The maximum disturbances from the positive and negative regions of delta B (Bp and Bn, respectively) are investigated with respect to their correlation with (1) the average N-S component, Bz, (2) the average angle with respect to the solar magnetospheric equatorial plane, theta (3) the variance, sigma sub i, and (4) the magnitude, Bi, of the interplanetary magnetic field. These quantities were averaged over a period, T, ranging from 20 min. to 8 hours prior to the measurement of Bp or Bn. Variations (i.e., disturbances) in total magnetic field magnitude were studied utilizing data from the Polar Orbiting Geophysical Observatory satellites (OGO 2, 4, and 6), unofficially referred to as POGO. Author

**N74-29757\*** Army Foreign Science and Technology Center, Charlottesville, Va.

#### **RESULTS OF TESTS OF A TSNIIGAIIK (CENTRAL SCIENTIFIC RESEARCH INSTITUTE OF GEODESY, AERIAL SURVEYING AND CARTOGRAPHY) AIRBORNE RADIO RANGE FINDER IN A MOUNTAINOUS REGION**

I. L. Gill and K. N. Gertsanova 9 Nov. 1973 7 p Transl. into ENGLISH from Geodeziya i Kartografiya (USSR), no. 6, 1972 p 40-43

(AD-779602; FSTC-HT-23-778-73) Avail: NTIS CSCL 08/5

In tests of an airborne radio range finder, measurement of the base by internal traverse of the direction line, radio geodetic determination of coordinates and laying out of skeleton routes along a series of points of the survey base were carried out. In distinction from use over flat terrain, flight heights were determined from barometric data for reduction of distances to the surface of an ellipsoid. Base measurements at 3000 and 4000 m were unsatisfactory, due to the presence of obstacles to passage of radio waves; however, recordings at 5000 m were wavy, but readable. A method of determination of the root mean error is presented and the resulting errors are of the same order of magnitude as in aerial surveys at the same scale in flat regions. GRA

**N74-30679\*** Itek Corp., Lexington, Mass. Optical Systems Div.

#### **AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Final Report**

Nicholas Gramenopoulos, Principal Investigator Jul. 1974 100 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21766)

(E74-10688; NASA-CR-139221) Avail: NTIS HC \$8.00 CSCL 08B

The author has identified the following significant results. A diffraction pattern analysis of MSS images led to the development of spatial signatures for farm land, urban areas and mountains. Four spatial features are employed to describe the spatial characteristics of image cells in the digital data. Three spectral features are combined with the spatial features to form a seven dimensional vector describing each cell. Then, the classification of the feature vectors is accomplished by using the maximum likelihood criterion. It was determined that the recognition accuracy with the maximum likelihood criterion depends on the statistics of the feature vectors. It was also determined that for a given geographic area the statistics of the classes remain invariable for a period of a month, but vary substantially between seasons. Three ERTS-1 images from the Phoenix, Arizona area were processed, and recognition rates between 85% and 100% were obtained for the terrain classes of desert, farms, mountains, and urban areas. To eliminate the need for training data, a new clustering algorithm has been developed. Seven ERTS-1 images from four test sites have been processed through the clustering algorithm, and high recognition rates have been achieved for all terrain classes.

**N74-30683\*** Geological Survey, Denver, Colo.

#### **A SYNTHESIS OF SAND SEAS THROUGHOUT THE WORLD Final Report, 1 Jul. 1972 - 31 Mar. 1974**

Edwin D. McKee, Carol S. Breed, Principal Investigators, Steven Fryberger, Dana Gebel, and Camilla McCauley 1 Apr. 1974 95 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (NASA Order S-70243-AG-4)

(E74-10693; NASA-CR-139226) Avail: NTIS HC \$7.75 CSCL 08M

**N74-30686\*** Naval Research Lab., Washington, D.C.

#### **TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Jun. 1974**

Allan Shapiro, Principal Investigator 8 Aug. 1974 1 p EREP (NASA Order T-4716-B)

(E74-10697; NASA-CR-139316) Avail: NTIS HC \$4.00 CSCL 08B

**N74-30689\*** Battelle Columbus Labs., Ohio.

#### **CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Jul. - 31 Jul. 1974**

A. G. Mourad, D. M. J. Fubara, Principal Investigators, and M. B. Kuhner 15 Aug. 1974 7 p EREP (Contract NAS9-13276)

(E74-10700; NASA-CR-139320; PR-17) Avail: NTIS HC \$4.00 CSCL 08E

**N74-30720\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

#### **MAPPING SOILS, CROPS, AND RANGELANDS BY MACHINE ANALYSIS OF MULTITEMPORAL ERTS-1 DATA**

Marion F. Baumgardner and James A. Henderson, Jr. In NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 205-223

ERTS-1 data, obtained during the period 25 August 1972 to 5 September 1973 over a range of test sites in the Central United States, have been used for identifying and mapping differences in soil patterns, species and conditions of cultivated crops, and conditions of rangelands. Multispectral scanner data from multiple ERTS passes over certain test sites have provided the opportunity to study temporal changes in the scene. Multispectral classifications delineating soils boundaries in different test sites compared well with existing soil association maps prepared by conventional means. Spectral analysis of ERTS data was used to identify, map, and make areal measurements of wheat in western Kansas. Multispectral analysis of ERTS-1 data provided patterns in rangelands which can be related to soils differences, range management practices, and the extent of infestation of grasslands by mesquite (*Prosopis fuliflora*) and juniper (*Juniperus* spp.). Author

**N74-30743\*** Geological Survey, Reston, Va.  
**TOWARDS AN OPERATIONAL ERTS - REQUIREMENTS FOR IMPLEMENTING CARTOGRAPHIC APPLICATIONS OF AN OPERATIONAL ERTS TYPE SATELLITE**  
 Alden P. Colvocoresses /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 539-557 refs

(Paper-L15) CSCL 08B

After nearly 18 months of successful operation of the first Earth Resources Technology Satellite (ERTS-1), a careful look at the future in order. Judging from the results of ERTS-1 experiments, public sales of ERTS-1 products and overall worldwide response it is believed that ERTS-1 has demonstrated an earth sensing mode that should become operational. It is recognized that several studies leading to the definition of an operational ERTS have been made. However cartographic requirements are generally more basic and demanding than those of the earth science disciplines and are therefore treated separately in this report. One assumption made is that the configuration of ERTS, particularly with respect to the multispectral scanner and data transmission rates cannot be materially altered. Author

**N74-30805\*** Bendix Corp., Ann Arbor, Mich. Aerospace systems Div.  
**AUTOMATED STRIP-MINE AND RECLAMATION MAPPING FROM ERTS**  
 Robert H. Rogers, Larry E. Reed, and Wayne A. Pettyjohn (Ohio State Univ.) /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1519-1531

(Paper-E3) CSCL 08I

Using computer processing techniques, it is possible to produce geometrically-corrected maps of the coal strip mines in East-Central Ohio by utilizing ERTS-1 CCTs. Several target categories can be drawn by a computer-controlled pen on film that will accurately overlay a base map of any scale selected by the operator. For each overlay, the computer can generate a table that shows the area of each target category in square kilometers, acres, or percent of total area. Author

**N74-30806\*** Ohio Dept. of Economic and Community Development, Columbus.  
**SIGNIFICANT APPLICATIONS OF ERTS-1 DATA TO RESOURCE MANAGEMENT ACTIVITIES AT THE STATE LEVEL IN OHIO**  
 David C. Sweet, P. G. Pincura, C. J. Meier (Dept. of Natural Resources), G. B. Garrett (Ohio EPA), L. Herd (DOT, State Government of Ohio), G. E. Wukelic (Battelle Columbus Labs., Ohio), J. G. Stephan (Battelle Columbus Labs., Ohio), and H. E. Smail (Battelle Columbus Labs., Ohio) /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1533-1555 refs  
 (Paper-E4) CSCL 08F

Described are techniques utilized and the progress made in applying ERTS-1 data to (1) detecting, inventorying, and monitoring surface mining activities, particularly in relation to recently passed strip mine legislation in Ohio; (2) updating current land use maps at various scales for multiagency usage, and (3) solving other real-time problems existing throughout the various Ohio governmental agencies. General conclusions regarding current user views as to the opportunities and limitations of operationally using ERTS-1 data at the state level are also noted. Author

**N74-30825\*** Itek Corp., Lexington, Mass.  
**AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-1 IMAGES**  
 Nicholas Gramenopoulos /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1845-1875 refs

(Paper-I11) CSCL 08B

Results of an automated thematic mapping investigation using ERTS-1 MSS images are presented. A diffraction pattern analysis of MSS images led to the development of spatial signatures for farm land, urban areas, and mountains. Four spatial features are employed to describe the spatial characteristics of image cells in the digital data. Three spectral features are combined with the spatial features to form a seven dimensional vector describing each cell. Then, the classification of the feature vectors is accomplished by using the maximum likelihood criterion. Three ERTS-1 images from the Phoenix, Arizona area were processed, and recognition rates between 85% and 100% were obtained for the terrain classes of desert, farms, mountains and urban areas. To eliminate the need for training data, a new clustering algorithm has also been developed. Author

**N74-30834\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.  
**THE USE OF REMOTE SENSING IN MOSQUITO CONTROL**  
 Feb. 1973 17 p refs Original contains color illustrations (NASA-TM-X-70293; MSC-07644) Avail: NTIS MF \$1.45; SOD HC \$0.55 CSCL 06C

The technology of remote sensing, developed by the space program for identification of surface features from the vantage point of an aircraft or satellite, has substantial application in precisely locating mosquito breeding grounds. Preliminary results of the NASA technology working cooperatively with a city government agency in solving this problem are discussed. Author

**N74-30837#** Joint Publications Research Service, Arlington, Va.  
**SOME FUNDAMENTAL PROBLEMS IN MEASURING AND COMPUTING A SATELLITE GEODETIC VECTOR TRAVERSE ARCTIC-ANTARCTICA**  
 F. Khalmosh 10 Jul. 1974 15 p refs Transl. into ENGLISH from Acta Geod., Geophys. Montanistica (Hungary), v. 8, no. 1-2, 1973 p 3-14  
 (JPRS-62436) Avail: NTIS HC \$4.00  
 A method and instrument for measuring a satellite vector traverse are described. Author

**N74-30843\*#** Research Triangle Inst., Research Triangle Park, N.C.  
**ENGINEERING STUDIES RELATED TO GEODETIC AND OCEANOGRAPHIC REMOTE SENSING USING SHORT PULSE TECHNIQUES Final Engineering Report for Tasks B and E**  
 L. S. Miller, G. S. Brown, and G. S. Hayne Feb. 1973 120 p refs  
 (Contract NAS6-2135)  
 (NASA-CR-137466) Avail: NTIS HC \$9.00 CSCL 14B

For the Skylab S-193 radar altimeter, data processing flow charts and identification of calibration requirements and problem areas for defined S-193 altimeter experiments are presented. An analysis and simulation of the relationship between one particular S-193 measurement and the parameter of interest for determining the sea surface scattering cross-section are considered. For the GEOS-C radar altimeter, results are presented for system analyses pertaining to signal-to-noise ratio, pulse compression threshold behavior, altimeter measurement variance characteristics, desirability of onboard averaging, tracker bandwidth considerations, and statistical character of the altimeter data in relation to harmonic analysis properties of the geodetic signal.

Author

**N74-31783** Department of Energy, Mines and Resources, Ottawa (Ontario).

**A THREE-COMPONENT AEROMAGNETIC SURVEY OF BRITISH COLUMBIA AND THE ADJACENT PACIFIC OCEAN** Publications of the Earth Physics Branch, Vol. 44, No. 14

W. Hannaford and G. V. Haines 1974 56 p refs  
Copyright. Avail: Issuing Activity CSDL 08N

The geomagnetic components D,H,Z, and the total intensity F were measured at 4.6 km to 6.2 km altitude along flight lines traversing British Columbia and extending 1,400 km westward over the Pacific. The determination of systematic errors, mainly due to aircraft magnetic fields, is described. The corrected data, reduced to sea level and averaged over five-minute intervals, are listed. Further smoothing was applied to produce contoured charts of D,H,Z, and the Z anomaly field. Some features of the Z anomaly chart are discussed. One anomaly, prominent over a large area in northeastern British Columbia is fitted by models and compared with Precambrian Shield anomalies of similar scale reported by others. IGRF residuals derived from the five-minute averages are shown as profiles in D,H,Z, and F. The regional field, in the form of a 3rd-degree polynomial, is compared with IGRF.

Author

**N74-31794\*** Geological Survey, Reston, Va.  
**THE CARTOGRAPHIC APPLICATION OF ERTS/RBV IMAGERY IN POLAR REGIONS** Progress Report, 1 Mar. - 30 Apr. 1974

William R. MacDonald, Principal Investigator 1 May 1974 5 p ERTS  
(NASA Order S-70243-AG-2)  
(E74-10713; NASA-CR-139546) Avail: NTIS HC \$4.00 CSDL 08B

The author has identified the following significant results. A 1:1,000,000 scale sketch map has been prepared from ERTS imagery of the Prince Olav Coast, Antarctica. This is the first such mapping of the extent of the ice tongues of the Shtrase and Fietta Bay glaciers. Shtrase is of particular interest because the ERTS imagery shows the tongue extending out into the Lutzom-Holm Bay approximately 32 miles further than ever depicted on existing maps. This sketch map and others in work covering coastal areas of the Antarctic continent show many coastal changes when compared to what is believed to be the most current published maps. These sketch maps along with the accompanying mosaics will be a bench mark for future revision to existing maps and charts and also an invaluable source for new mapping. ERTS imagery is now available over Mt. Siple, Antarctica, and it is expected to provide a source to position Mt. Siple correctly in relation to the Executive Committee Range. A mosaic at 1:500,000 scale is also being compiled that will serve as a source for future revision of 1:250,000 scale maps of the Ellsworth Mountains, change and improve the shape and size of the islands within the Ronne Ice Shelf, and redefine the ice front of the Ronne and Filchner Shelves.

**N74-31800\*** Geological Survey, Reston, Va.  
**CARTOGRAPHIC EVALUATION OF SKYLAB S-192 SCANNER IMAGES** Quarterly Progress Report, 1 May - 31 Jul. 1974

John D. McLaurin, Principal Investigator 31 Jul. 1974 3 p EREP  
(NASA Order T-4111-B)  
(E74-10719; NASA-CR-139551) Avail: NTIS HC \$4.00 CSDL 08B

**N74-31802\*** Geological Survey, Washington, D.C. Topographic Div.

**INVESTIGATION OF ERTS/MSS IMAGERY FOR PHOTO-MAPPING OF THE UNITED STATES** Progress Report, 1 Jan. 1974 - 28 Feb. 1974

Joseph T. Pilonaro, Principal Investigator 1 Mar. 1974 2 p ERTS  
(NASA Order S-70243-AG)  
(E74-10721; NASA-CR-139554) Avail: NTIS HC \$4.00 CSDL 08B

The author has identified the following significant results. A UTM grid has been fitted to the 1:250,000 scale photomap and has resulted in a RMSE of 50 meters which is well within National Map Accuracy Standards. Fitting of the UTM grid to the State of Arizona photomaps is in progress.

**N74-32780\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**AN OPTICAL PROCESS FOR PRODUCING CLASSIFICATION MAPS FROM MULTISPECTRAL DATA** Patent Application

Richard E. Haskell, inventor (to NASA) (Oakland Univ.) Filed 30 Aug. 1974 29 p  
(Grant NGR-23-054-006)  
(NASA-Case-MSC-14472-1; US-Patent-Appl-SN-502138) Avail: NTIS HC \$4.50 CSDL 08B

A method of producing single-class and multi-class composite classification maps from multispectral data is provided. The multispectral data is transformed into a binary matrix format which is then encoded on an optical medium such as photographic film. The encoded data is holographically correlated with coded patterns representing selected spectral signatures to produce signal-class classification maps. Several single-class maps are optically superimposed to produce multi-class composite classification maps.

NASA

**N74-32801\*** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

**REPORTS ON MAPPING AND TOPOGRAPHIC MEASUREMENTS. SERIES 1: ORIGINAL CONTRIBUTIONS, ISSUE NO. 62 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 62]**

1974 114 p In GERMAN; ENGLISH summary  
Avail: NTIS HC \$8.75

Instructions for the operation of the GZ1 orthoprojector in storage mode are given, namely for the preparation of orthophotos either with or without sheet lines, as well as with or without junction of models. The following procedures are described for the different combinations of Zeiss equipment: (1) profile measurement by means of the C 8 stereoplanigraph and profile scribing by SG 1 storage unit; (2) profile measurement by planimat and profile scribing by SG 1 storage unit; (3) projection of the orthophoto and of the dropped lines GZ 1 orthoprojector and LG 1 scanning unit, as well as by HS dropped line attachment; and (4) projection of the orthophoto and of the contour lines by GZ 1 orthoprojector 1/O-Int optical interpolation system and HLZ electronic contourliner.

Author

**N74-33832\*** Battelle Columbus Labs., Ohio.  
**CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID** Progress Report, 1 Aug. - 31 Aug. 1974  
 A. G. Mourad, D. M. J. Fubara, Principal Investigators, and M. B. Kuhner 20 Sep. 1974 3 p EREP  
 (Contract NAS9-13276)  
 (E74-10765; NASA-CR-140005; PR-18) Avail: NTIS HC \$4.00 CSCL 08E

**N74-33846\*** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).  
**REPORTS ON MAPPING AND TOPOGRAPHIC MEASUREMENTS. SERIES 1: ORIGINAL CONTRIBUTIONS, ISSUE NO. 61 [NACHRICHTEN AUS DEM KARTEN UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 61]**  
 1973 75 p refs In GERMAN; ENGLISH summary  
 Avail: NTIS HC \$6.75  
 Computer techniques for contour analysis and relief mapping are discussed.

**N74-33848** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).  
**AUTOMATIC DEDUCTION OF A BUILDING AREA IN 1:200 000 SCALE FROM 1:50 000 DIGITAL SCALED AREAS AND SINGLE BUILDINGS [DIE AUTOMATISCHE ABLEITUNG EINER SIEDLUNGSDARSTELLUNG IM MASSSTAB 1:200 000 AUS IM MASSSTAB 1:50 000 DIGITALISIERTEN FLAECHEN UND EINZELHAUSEN]**  
 Hans-Joerg Gottschalk In its Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 19-29 ref In GERMAN; ENGLISH summary  
 Single houses, center areas and big area buildings are digitized in a 1:50,000 scale topographical map. A representation of

**N74-33875\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.  
**LAND USE AND MAPPING**  
 Armond T. Joyce In its 3rd ERTS Symp., Vol. 3, May 1974 p 15-32 refs  
 CSCL 08B

This summary is divided into two basic sections—one dealing with land use classification and delineation, and the other dealing with mapping. The term land use classification is used in respect to the actual use of land rather than land capability, land suitability, or the potential use of land. The classification of actual use of the land, as defined by man's activities that are related to the land, may be only inferred, rather than directly interpreted, in the case of the identification and classification of some surface features or vegetation cover types. Also, in the case of some surface features or vegetational cover types, the specific activity involving man's use of the land may not be designated in a four-level classification system until level 3 or level 4 is reached. Most investigations employed or implied a hierarchical land use classification scheme with more than two levels, but mainly addressed themselves to classifying and delineating surface features (land use) that would fall in the first two levels of a three- or four-level hierarchical scheme. Although not all investigators used a hierarchical classification scheme or concurred with the idea (computer-implemented classifications with digital data are not conducive to a hierarchical classification approach), the classification system proposed by the U.S. Department of the Interior is used as reference. Author

**N74-33886\*** South Dakota State Univ., Brookings. Remote Sensing Inst.  
**REMOTE SENSING TECHNIQUES FOR MAPPING RANGE SITES AND ESTIMATING RANGE YIELD**

L. A. Benson, C. J. Frazee, F. A. Waltz, C. Reed, R. L. Carey, and J. L. Gropper Jun. 1974 48 p refs Prepared in cooperation with Bureau of Indian Affairs, Aberdeen, South Dakota  
 (Grant NGL-42-003-007)  
 (NASA-CR-140394; SDSU-RSI-73-19) Avail: NTIS HC \$5.50 CSCL 08B

Image interpretation procedures for determining range yield and for extrapolating range information were investigated for an area of the Pine Ridge Indian Reservation in southwestern South Dakota. Soil and vegetative data collected in the field utilizing a grid sampling design and digital film data from color infrared film and black and white films were analyzed statistically using correlation and regression techniques. The pattern recognition techniques used were K-class, mode seeking, and thresholding. The herbage yield equation derived for the detailed test site was used to predict yield for an adjacent similar field. The herbage yield estimate for the adjacent field was 1744 lbs. of dry matter per acre and was favorably compared to the mean yield of 1830 lbs. of dry matter per acre based upon ground observations. Also an inverse relationship was observed between vegetative cover and the ratio of MSS 5 to MSS 7 of ERTS-1 imagery. Author

**N74-33927\*** Geological Survey, Reston, Va. Topographic Div.  
**RESEARCH AND DEVELOPMENT IN TOPOGRAPHIC MAPPING**  
 Apr. 1974 73 p  
 (PB-232451/5; USGS-TD-74-001) Avail: NTIS HC \$3.75 CSCL 08B

The annual report, covering the 12-month period ending in April 1974, summarizes the research and development activities of the U.S. Geological Survey, Topographic Division in the Office of Research and Technical Standards and in the Region offices at Arlington, Va., Rolla, Mo., Denver, Colo., and Menlo Park, Calif. The R and D projects mentioned concern the fields of cartography, field surveys, photogrammetry, orthophotomapping, and space technology. Articles by Division personnel prepared for presentation at meetings and conferences or for publication in professional journals and the Manual of Topographic Instructions are also listed. GRA

**N74-34734\*** Imperial Government of Iran, Tehran.  
**AN EVALUATION OF THE UTILITY OF ERTS-1 DATA FOR MAPPING AND DEVELOPING NATURAL RESOURCES OF IRAN** Final Report  
 K. Ebtehadi, Principal Investigator Jul. 1974 211 p refs  
 Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
 (E74-10758; NASA-CR-139998) Avail: NTIS HC \$13.75 CSCL 08B

The author has identified the following significant results. Results are reported in structural mapping leading to tectonic interpretation; in surficial deposits mapping; in analysis of salt diapirism in southwest Iran; in updating and correcting existing hydrological maps; in monitoring fluctuations of water in some intermittent lakes; in the delineation of wetland areas and the study of fluvial suspended load of the head of the Persian Gulf in relation to the fishing industry; in exercises in soil mapping; in range and agricultural surveys and inventory using multistage sampling methods, and in the computer analysis of ERTS-1 digital tapes for urban land use. The completion of a 1:1,000,000 false color photomosaic of Iran is also discussed.

**N74-34748\*** Hunting Surveys, Ltd., Boreham Wood (England).  
**CARTOGRAPHIC RESEARCH IN EREP PROGRAMME FOR SMALL SCALE MAPPING**  
 P. G. Mott, Principal Investigator 12 Aug. 1974 3 p Sponsored by NASA EREP  
 (E74-10781; NASA-CR-140134) Avail: NTIS HC \$3.25 CSCL 08B

### 03 GEODESY AND CARTOGRAPHY

**N74-34754\*** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.  
**YELLOWSTONE NATIONAL PARK MAPPING FROM ERTS-1 COMPUTER COMPATIBLE TAPES Final Report, May 1972 - May 1974**

F. J. Thomson, Principal Investigator and N. E. Roller Sep. 1974 35 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21783)  
(E74-10787; NASA-CR-140140; ERIM-193300-50-F) Avail: NTIS HC \$4.75 CSDL 08B

**N74-34765\*** Hunting Surveys, Ltd., Boreham Wood (England).  
**CARTOGRAPHIC RESEARCH IN EREP PROGRAMME FOR SMALL SCALE MAPPING Quarterly Report**

P. G. Mott and J. D. Leatherdale, Principal Investigators 11 Oct. 1974 1 p Sponsored by NASA EREP  
(E74-10798; NASA-CR-140428; QR-2) Avail: NTIS HC \$3.25 CSDL 08B

**N74-34782\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**AERIAL RECONNAISSANCE OVER THE ISLAND OF HAWAII**

Ronald Greeley (Santa Clara Univ., Calif.) In Its Guidebook to the Hawaiian Planetology Conf. Aug. 1974 p 113-183 refs

CSDL 08B

The flight sequence in this guide is nominal and based on optimum weather conditions; it may be altered, depending upon weather and visibility. Also included at the end of the flight sequence for the island of Hawaii are sections for parts of Maui (Haleakala Volcano) and Molokai, which will be flown if Hawaii is completely obscured at flight time. Author

**N74-34798\*** Joint Publications Research Service, Arlington, Va.

**GEODESY AND AERIAL PHOTOGRAPHY, 1972**

19 Sep. 1974 177 p refs Transl. into ENGLISH of Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 3-132  
(JPRS-63013) Avail: NTIS HC \$12.00

Development and implementation of aerial photogeodesy and related cartographic fields of specialization are considered.

**N74-34799** Joint Publications Research Service, Arlington, Va.  
**FUNDAMENTAL ADVANCES IN GEODESY IN THE USSR**

V. P. Morozov In its Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 30-43 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 21-30

An overview of astrogeodetic work is given that ranges from classical triangulation, light and rangefinding polygonometry, and trilateration to spheroidal geodesy and associated mathematical processing methods. G.G.

**N74-34800** Joint Publications Research Service, Arlington, Va.  
**GEODESY AND SPACE**

L. P. Pellinen In its Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 44-55 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 31-38

Optical and radio observations of artificial satellites are utilized to obtain geodetic information of high accuracy. The former constitute photographing earth satellites against a background of stars, and laser ranging; the latter encompass Doppler measurements on satellite radial velocity as well as radar methods. G.G.

**N74-34801** Joint Publications Research Service, Arlington, Va.  
**ROLE OF GEODETIC ENGINEERING IN THE NATIONAL ECONOMY**

N. N. Lebedev In its Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 56-69 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 39-48

Methods and procedures of geodetic engineering are described and their impact on planning and construction of industrial factories, on implementing measures in forestry and agriculture, and on development of natural resources and urban settlements, are elaborated. G.G.

**N74-34805** Joint Publications Research Service, Arlington, Va.  
**DEVELOPMENT OF AERIAL SURVEYING**

Docent N. P. Lavrova and M. D. Konshin In its Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 101-113 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 73-81

Aerial photographic surveying by automatic interplanetary Zond stations resulted in: (1) the development of compiling maps of the lunar surface at scales of 1:1,000,000 and 2:1:2,000,000; (2) chemical photographic processing of space photographs; (3) spectrophotometric investigations of the lunar and earth's surface; (4) creation of brightness maps for the earth and moon; (5) studies on cloud formations for weather prediction; and (6) physiographic regionalization of extensive territories. G.G.

**N74-34807** Joint Publications Research Service, Arlington, Va.  
**SOVIET CARTOGRAPHY, ITS ATTAINMENTS AND PATH OF DEVELOPMENT**

V. I. Sukhov, A. I. Preobrazhenskiy, and N. M. Volkov In its Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 124-137 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 91-99

Scientific principles and practical developments of various cartographic products are briefly reported with emphasis on special mapping for physical geography. G.G.

**N74-34814\*** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**A SYSTEM TO GEOMETRICALLY RECTIFY AND MAP AIRBORNE SCANNER IMAGERY AND TO ESTIMATE GROUND AREA Technical Report, 1 Feb. 1973 - 31 Jan. 1974**

M. M. Spencer, J. M. Wolf, and M. A. Schall Washington NASA Oct. 1974 46 p refs  
(Contract NAS9-9784)  
(NASA-CR-2460; ERIM-190100-28-T) Avail: NTIS HC \$3.25 CSDL 08B

A system of computer programs were developed which performs geometric rectification and line-by-line mapping of airborne multispectral scanner data to ground coordinates and estimates ground area. The system requires aircraft attitude and positional information furnished by ancillary aircraft equipment, as well as ground control points. The geometric correction and mapping procedure locates the scan lines, or the pixels on each line, in terms of map grid coordinates. The area estimation procedure gives ground area for each pixel or for a predesignated parcel specified in map grid coordinates. The results of exercising the system with simulated data showed the uncorrected video and corrected imagery and produced area estimates accurate to better than 99.7%. Author

## GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

**A74-39719 \*** **Geologic uses and non-uses of ERTS-1 Northern Rocky Mountains and similar areas.** R. M. Weidman and D. D. Alt (Montana, University, Missoula, Mont.). In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 38E-1 to 38E-5. Contract No. NAS5-21826.

Using prints of ERTS-1 multispectral scanner imagery a large area of varied geology and vegetative cover was studied, utilizing the classic methods of photogeology generally applied to conventional aerial photographs. The study area was mainly the western half of Montana, but extension of tectonic annotations to the west resulted in coverage of most of the northern Rocky Mountains, as well as the plains to the east. The northern Rocky Mountains are exceptionally suitable for a feasibility study because they contain a wide range of geologic styles exposed under varying conditions of plant and soil cover. The basic approach was to study the satellite imagery visually, applying background knowledge of regional geology and experience with conventional aerial photographs. F.R.L.

**A74-42086 #** **Use of Skylab S-190A and S-190B photographs in Wyoming earth resource studies.** R. S. Houston and R. W. Marrs (Wyoming, University, Laramie, Wyo.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-142.* 40 p. 27 refs.

Remote sensor data provided by Skylab and other earth resources satellites and aircraft yields information that can result in significant savings in time and money spent in resource studies. Research has demonstrated the utility of these data in a variety of applications. University of Wyoming researchers have applied ERTS, Skylab, and aircraft imagery to general geologic mapping, mineral exploration, tectonics, land-use, and vegetation mapping. Most applications were accomplished through visual analysis of image data. Image enhancement procedures were applied in some studies. In general the resource studies indicate that satellites such as ERTS provide data that is most useful in regional studies and must be augmented by aerial photography if detailed information is required. Skylab imagery combines the regional perspective with greater image detail, thus minimizing the necessity for the more expensive low-altitude coverage. (Author)

**A74-42088 \* #** **Recent processed results from the Skylab S-192 multispectral scanner.** F. J. Thomson. *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-144.* 16 p. Contracts No. NAS9-13386; No. NAS9-13317.

Some early results are presented of attempts to map rock types on the basis of digital tape data from the Skylab S-192 multispectral scanner. The area selected is White Sands, New Mexico. The data has been collected on the SL-2 mission on June 20, 1973. An enlargement of a portion of an S-190A color photograph collected on Skylab Track 20 is considered. Spectral pattern recognition techniques, implemented on an IBM 7094 computer, were used to process the S-192 data. Processing procedures performed in a preparation of the data before the application of pattern recognition are briefly discussed. The analysis rock type spectra yielded 24 promising spectral channel ratio features for separating the rock types. It is concluded that the S-192 sensor data have great potential for lithologic mapping. G.R.

**A74-42807** **Remote sensing in mineral exploration.** M. M. Cole, E. S. O. Jones, and N. D. E. Custance (Bedford College, London, England). In: Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 49-66. 19 refs.

Remote sensing techniques may assist mineral exploration in several ways, different individual imaging techniques being appropriate to specific problems and to particular areas. These techniques are discussed in relation to studies in Africa and Australia. Reconnaissance remote sensing studies in central southern Africa indicate the uses of geobotanical anomalies for the delineation of mineralized stratigraphical horizons. A current programme of remote sensing studies in Western Queensland is outlined, together with preliminary results for the delineation of geological units, structural features and geobotanical anomalies. The location of ore bodies in the vicinity of the Dugald River Lode is discussed in relation to the spectral signatures of vegetation types, and the potential of space-borne vehicles for such studies is assessed. (Author)

**A74-46194** **Optimal selection of spectral intervals in the study of natural formations from space.** K. Ia. Kondrat'ev, O. B. Vasil'ev, and G. A. Ivanian. (*Kosmicheskie Issledovaniia*, vol. 12, Jan.-Feb. 1974, p. 122-128.) *Cosmic Research*, vol. 12, no. 1, July 1974, p. 108-113. 12 refs. Translation.

Informativeness evaluation of different spectral regions in earth surface feature surveys indicates that the set of spectral channels of the ERTS satellite is not optimal. The spectral contrasts of ERTS are found to differ considerably from those inferred from Soyuz 7 and 9 data. Analysis of spectral entropy and contrasts at wavelengths from 0.4 to 0.9 microns suggests that the most informative wavelengths are 0.54 to 0.56, 0.66 to 0.69, and 0.78 to 0.82 microns. V.Z.

**N74-29682\* #** **Institut Francais du Pétrole, Rueil-Malmaison. STUDY GEOMORPHOLOGY, PAST AND PRESENT. LINEAR TRENCH, TECTONICS RELATIONSHIP BETWEEN PYRENEES AND ALPS Final Report, Jul. 1972 - Apr. 1974** Jacques Guillemot, Principal Investigator Apr. 1974 25 p refs Sponsored by NASA ERTS (E74-10568; NASA-CR-138869) Avail: NTIS HC \$4.25 CSCL 08G

The author has identified the following significant results. ERTS-1 images obviously show up some large linear features trending N 80 E or N 30 E common to both Alps and Pyrenees. One of them, the Ligurian Fault, had been previously forecast by Laubscher in an interpretation of the Alps by the plate tectonic theory, but it extends westward farthest from the Alps, cutting the Pyrenees axis. These lineaments have been interpreted as reflections of deep seated wrench faults in the surficial part of the sedimentary series. A large set of such lineaments is perceptible in western Europe, such as the Guadalquivir Fault in southern Spain, Ligurian Fault, Insubrian Fault, Northern-Jura Fault, Metz Fault. Perhaps these may be interpreted as transform-faults of the mid-Atlantic ridge or of a paleo-rift seated in the Rhine-Rhone graben.

**N74-29684\* #** **Iowa Univ., Iowa City. Dept. of Geology. EXPERIMENT TO EVALUATE FEASIBILITY OF UTILIZING SKYLAB-EREP REMOTE SENSING DATA FOR TECTONIC ANALYSIS OF THE BIGHORN MOUNTAINS REGION, WYOMING-MONTANA Quarterly Progress Report, 1 Apr. - 30 Jun. 1974** Richard A. Hoppin, Principal Investigator 11 Jul. 1974 2 p EREP (Contract NAS9-13313)

## 04 GEOLOGY AND MINERAL RESOURCES

(E74-10599; NASA-CR-138708) Avail: NTIS HC \$4.00 CSCL 08G

**N74-29688\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE** Monthly Report, 1-30 Jun. 1974  
R. J. P. Lyon and F. R. Honey, Principal Investigators 30 Jun. 1974 3 p EREP  
(Contract NAS9-13357)  
(E74-10656; NASA-CR-138888; MR-11) Avail: NTIS HC \$4.00 CSCL 08G

**N74-29689\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE** Monthly Report, 1-31 May 1974  
R. J. P. Lyon and F. R. Honey, Principal Investigators 31 May 1974 3 p EREP  
(Contract NAS9-13357)  
(E74-10657; NASA-CR-138889; MR-10) Avail: NTIS HC \$4.00 CSCL 08G

**N74-29690\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE** Monthly Report, 1-31 Mar. 1974  
R. J. P. Lyon and F. R. Honey, Principal Investigators 31 Mar. 1974 3 p EREP  
(Contract NAS9-13357)  
(E74-10659; NASA-CR-138891; MR-8) Avail: NTIS HC \$4.00 CSCL 08G

**N74-29691\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE** Monthly Report, 1-28 Feb. 1974  
R. J. Lyon and F. R. Honey, Principal Investigators 28 Feb. 1974 3 p EREP  
(Contract NAS9-13357)  
(E74-10660; NASA-CR-138892; MR-7) Avail: NTIS HC \$4.00 CSCL 08G

**N74-29713#** National Oceanic and Atmospheric Administration, Boulder, Colo.  
**CATALOGUE OF DIGITAL GEOMAGNETIC VARIATION DATA AT WORLD DATA CENTER A FOR SOLAR-TERRESTRIAL PHYSICS**  
Environ. Data Serv. Jul. 1974 25 p refs  
(UAG-35) Avail: NTIS MF \$1.45; National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC \$0.20

Hourly and 2.5 minute values for geomagnetic variation data recorded on magnetic tape were obtained from many sources and compiled in a tabular format. Other information of interest is also provided including a global map showing locations of observatories from which magnetic readings were taken, a list

of additional magnetic indices available in computer format, cost and availability information for the catalog, and an explanation of the catalog and magnetic tape formats. Sources of data are fully referenced. A.A.D.

**N74-29728\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.  
**GLOBAL DETAILED GEIOD COMPUTATION AND MODEL ANALYSIS**  
James G. Marsh and Samir Vincent (Computer Sciences Corp., Silver Spring, Md.) Mar. 1974 52 p refs Submitted for publication  
(NASA-TM-X-70709; X-921-74-131) Avail: NTIS HC \$5.75 CSCL 08B

Comparisons and analyses were carried out through the use of detailed gravimetric geoids which we have computed by combining models with a set of 26,000 1 deg x 1 deg mean free air gravity anomalies. The accuracy of the detailed gravimetric geoid computed using the most recent Goddard earth model (GEM-6) in conjunction with the set of 1 deg x 1 deg mean free air gravity anomalies is assessed at + or - 2 meters on the continents of North America, Europe, and Australia, 2 to 5 meters in the Northeast Pacific and North Atlantic areas, and 5 to 10 meters in other areas where surface gravity data are sparse. The R.M.S. differences between this detailed geoid and the detailed geoids computed using the other satellite gravity fields in conjunction with same set of surface data range from 3 to 7 meters. Author

**N74-29734#** Bureau of Mines, Denver, Colo. Mining Research Center.  
**IMPROVED ELECTRICAL RESISTIVITY FIELD SYSTEM FOR SHALLOW EARTH MEASUREMENTS**  
C. Melvin Lepper and James H. Scott 1974 22 p refs  
(BM-RI-7942) Avail: NTIS HC \$4.25 CSCL 08M

The Bureau of Mines has developed an improved earth resistivity field system which employs a technique for obtaining null measurements. The instrument is designed to operate reliably in high-noise environments such as those found in the vicinity of operating mines. The system consists of a low frequency transmitter, a sensitive receiver, and an external battery pack, each in its own case to provide protection from the elements. The receiver and transmitter units have self-contained rechargeable batteries to supply power to the circuitry and separate built-in battery chargers that operate on standard 115 Vac power. The system is portable and simple to operate. Measurement accuracy, reliability, and dynamic range are superior to most commercially available equipment even though less time and effort is required to make null readings. Unlike some commercial systems, long integration times are not required to enhance signal-to-noise ratio in areas of high background noise. Author

**N74-30664\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE** Monthly Report, 1-30 Apr. 1974  
R. J. P. Lyon and F. R. Honey, Principal Investigators 30 Apr. 1974 3 p EREP  
(Contract NAS9-13357)  
(E74-10658; NASA-CR-138890; MR-9) Avail: NTIS HC \$4.00 CSCL 08G

**N74-30666\*#** Kansas Univ. Center for Research, Inc., Lawrence, Atmospheric Science Lab.  
**DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB** Monthly Progress Report, Jun. 1974



Joe R. Eagleman, Principal Investigator, Wen Lin, and Larry League  
 Jun. 1974, 13 p refs EREP  
 (Contract NAS9-13273)  
 (E74-10671; NASA-CR-139237) Avail: NTIS HC \$4.00 CSCL  
 08H

**N74-30672\*#** Stanford Univ., Calif.  
**PHOTOLOGICAL ANALYSIS OF ERTS-1 IMAGERY, NORTHERN CALIFORNIA**  
 Ernest I. Rich, Principal Investigator [1974] 13 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
 (Contract NAS5-21775)  
 (E74-10680; NASA-CR-139245) Avail: NTIS HC \$4.00 CSCL  
 08G

**N74-30675\*#** Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Sciences.  
**GEOLOGICAL LANDFORM ANALYSIS IN THE CENTRAL PIEDMONT OF VIRGINIA AND NORTH CAROLINA Final Report, 1 Feb. - 16 Jul. 1974**  
 Lynn Glover, III, Principal Investigator 16 Jul. 1974 21 p refs ERTS  
 (Contract NAS5-21729)  
 (E74-10683; NASA-CR-139235) Avail: NTIS HC \$4.25 CSCL

**N74-30680\*#** Stanford Univ., Calif. Remote Sensing Lab.  
**MULTISPECTRAL SIGNATURES IN RELATION TO GROUND CONTROL SIGNATURE USING NESTED SAMPLING APPROACH Progress Report, 3 May - 3 Jul. 1974**  
 R. J. P. Lyon and F. R. Honey, Principal Investigators 3 Jul. 1974 5 p ERTS  
 (Contract NAS5-21884)  
 (E74-10690; NASA-CR-139223) Avail: NTIS HC \$4.00 CSCL  
 05B

The author has identified the following significant results. In a cooperative study with USGS personnel, it has been possible to detect a 1.5 by 1 mile anomaly on ERTS CCT data, in the pine-covered mountains of western Nevada. This anomalous area is about 3-5 times larger than that of the known geobotanical anomaly which lies centrally within the area. The site has been studied on the ground and bi-directional reflectances, relative to BaSO<sub>4</sub> obtained for 40 trees, using both in-vivo techniques (similar to cherry picker operations) and field determinations of cut branches. The anomaly can be seen best by color transparencies made from 5/4, 6/4, 7/4 ratioed digital data, the 3 ratios each being coded by one of 3 colors (blue, green, and red).

**N74-30690\*#** Nevada Univ., Reno. Mackay School of Mines.  
**THE GREAT BASIN INVESTIGATION Monthly Progress Report, Jul. 1974**  
 Jack G. Quade, Principal Investigator Jul. 1974 2 p EREP  
 (Contract NAS9-13274)  
 (E74-10701; NASA-CR-139321) Avail: NTIS HC \$4.00 CSCL

**N74-30691\*#** California Earth Science Corp., Santa Monica.  
**FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Jul. 1974**  
 Paul M. Merifield, Principal Investigator 5 Aug. 1974 2 p EREP  
 (Contract NAS2-7698)  
 (E74-10702; NASA-CR-139322; MPR-14) Avail: NTIS  
 HC \$4.00 CSCL 08E

**N74-30693\*#** Eason Oil Co., Oklahoma City, Okla.  
**AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION Final Report, Jan. 1973 - Jan. 1974**  
 Robert J. Collins, Principal Investigator, Frederic P. McCown, Leo P. Stonis, Gerald J. Petzel, and John R. Everett Jun. 1974 157 p refs Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
 (Contract NAS5-21735)  
 (E74-10704; NASA-CR-139433) Avail: NTIS HC \$11.00 CSCL  
 08G

The author has identified the following significant results. ERTS-1 data give exploration geologists a new perspective for looking at the earth. The data are excellent for interpreting regional lithologic and structural relationships and quickly directing attention to areas of greatest exploration interest. Information derived from ERTS data useful for petroleum exploration include: linear features, general lithologic distribution, identification of various anomalous features, some details of structures controlling hydrocarbon accumulation, overall structural relationships, and the regional context of the exploration province. Many anomalies (particularly geomorphic anomalies) correlate with known features of petroleum exploration interest. Linears interpreted from the imagery that were checked in the field correlate with fractures. Bands 5 and 7 and color composite imagery acquired during the periods of maximum and minimum vegetation vigor are best for geologic interpretation. Preliminary analysis indicates that use of ERTS imagery can substantially reduce the cost of petroleum exploration in relatively unexplored areas.

**N74-30747\*#** Wyoming Univ., Laramie. Dept. of Geology.  
**APPLICATION OF THE ERTS SYSTEM TO THE STUDY OF WYOMING RESOURCES WITH EMPHASIS ON THE USE OF BASIC DATA PRODUCTS**  
 Robert S. Houston, Ronald W. Marrs, Roy M. Breckenridge, and D. L. Blackstone, Jr. In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 595-619 refs

(Paper-G1) CSCL 08G

Many potential users of ERTS data products and other aircraft and satellite imagery are limited to visual methods of analyses of these products. Illustrations are presented from Wyoming studies that have employed these standard data products for a variety of geologic and related studies. Possible economic applications of these studies are summarized. Studies include regional geologic mapping for updating and correcting existing maps and to supplement incomplete regional mapping; illustrations of the value of seasonal images in geologic mapping; specialized mapping of such features as sand dunes, playa lakes, lineaments, glacial features, regional facies changes, and their possible economic value; and multilevel sensing as an aid in mineral exploration. Examples of cooperative studies involving botanists, plant scientists, and geologists for the preparation of maps of surface resources that can be used by planners and for environmental impact studies are given. Author

## 04 GEOLOGY AND MINERAL RESOURCES

**N74-30748\*** Missouri Geological Survey and Water Resources, Rolla.

### **SUMMARY OF AN INTEGRATED ERTS-1 PROJECT AND ITS RESULTS AT THE MISSOURI GEOLOGICAL SURVEY**

James A. Martin, William H. Allen, David L. Rath, and Ardel Rueff *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 621-631 refs

(Paper-G2) CSCL 08G

Use of the ERTS imagery involved the recognition and interpretation of various ground patterns. Analysis and application are tied to ongoing programs. Specific studies utilizing the imagery and NASA aircraft photography are: a statewide lake and dam inventory; assessment of flooding and floodprone areas along the Missouri portion of the Mississippi and Missouri Rivers; land-use classification for several counties; structural features in selected areas; and Pleistocene features in northern Missouri. Though it has been suggested that repetitive coverage is not necessary for geologic studies, it is this specific feature along with the synoptic view of large portions of the State that provided the potential for the utilization of the ERTS imagery in Missouri. Other State agencies, Departments of Conservation, Agriculture, and Community Affairs, have expressed interest in the potential application of ERTS data in their respective fields. Author

### **N74-30755\*** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. **GEOLOGIC APPLICATIONS OF ERTS IMAGES ON THE COLORADO PLATEAU, ARIZONA**

Alexander F. H. Goetz, Fred C. Billingsley, Donald P. Elston (Geological Survey, Flagstaff, Ariz.), Ivo Lucchitta (Geological Survey, Flagstaff, Ariz.), and Eugene M. Shoemaker (Calif. Inst. of Tech., Pasadena) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 719-744 refs

(Contract NAS7-100)

(Paper-G9) CSCL 08G

Three areas in central and northern Arizona centered on the (1) Verde Valley, (2) Coconino Plateau, and (3) Shivwits Plateau were studied using ERTS photography. Useful applications results include: (1) upgrading of the existing state geologic map of the Verde Valley region; (2) detection of long NW trending lineaments in the basalt cap SE of Flagstaff which may be favorable locations for drilling for new water supplies; (3) tracing of the Bright Angel and Butte faults to twice their previously known length and correlating the extensions with modern seismic events, showing these faults to be present-day earthquake hazards; (4) discovering and successfully drilling perched sandstone aquifers in the Kaibab Limestone on the Coconino Plateau; and (5) determining the relationship between the Shivwits lavas and the formation of the lower Grand Canyon and showing that the lavas should be an excellent aquifer, as yet untapped. Author

**N74-30757\*** Bureau de Recherches Geologiques et Minieres, Orleans (France).

### **STRUCTURAL INVESTIGATIONS IN THE MASSIF-CENTRAL, FRANCE**

J.-Y. Scanvic *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 757-766 refs

(Paper-G11) CSCL 08E

This survey covered the French Massif-Central (where crystalline and volcanic rocks outcrop) and its surrounding sedimentaries, Bassin de Paris, Bassin d'Aquitaine and Rhodanian valley. One objective was the mapping of fracturing and the surveying of its relationship with known ore deposits. During this survey it was found that ERTS imagery outlines lithology in some sedimentary basins. On the other hand, in a basement area, under temperature climate conditions, lithology is rarely expressed. These observations can be related to the fact that band 5 gives excellent results above sedimentary basins in France

and generally band 7 is the most useful in a basement area. Several examples show clearly the value of ERTS imagery for mapping linear features and circular structures. All the main fractures are identified with the exception of new ones found both in sedimentaries and basement areas. Other interesting findings concern sun elevation which, stereoscopic effect not being possible, simulates relief in a better way under certain conditions. Author

**N74-30758\*** Smithsonian Astrophysical Observatory, Cambridge, Mass.

### **STRUCTURAL GEOLOGY OF THE AFRICAN RIFT SYSTEM: SUMMARY OF NEW DATA FROM ERTS-1 IMAGERY**

P. A. Mohr *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 767-782 refs

(Paper-G12) CSCL 08G

ERTS imagery reveals for the first time the structural pattern of the African rift system as a whole. The strong influence of Precambrian structures on this pattern is clearly evident, especially along zones of cataclastic deformation, but the rift pattern is seen to be ultimately independent in origin and nature from Precambrian tectonism. Continuity of rift structures from one swell to another is noted. The widening of the Gregory rift as its northern end reflects an underlying Precambrian structural divergence, and is not a consequence of reaching the swell margin. Although the Western Rift is now proven to terminate at the Aswa Mylonite Zone, in southern Sudan, lineaments extend northeastwards from Lake Albert to the Eastern Rift at Lake Stefanie. The importance of en-echelon structures in the African rifts is seen to have been exaggerated. Author

**N74-30759\*** Colorado School of Mines, Golden.

### **MINERAL EXPLORATION WITH ERTS IMAGERY**

Stephen M. Nicolais *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 785-796 refs

(Contract NAS5-21778)

(Paper-G14) CSCL 08G

Ten potential target areas for metallic mineral exploration were selected on the basis of a photo-lineament interpretation of the ERTS image 1172-17141 in central Colorado. An evaluation of bias indicated that prior geologic knowledge of the region had little, if any, effect on target selection. In addition, a contoured plot of the frequency of photo-lineament intersections was made to determine what relationships exist between the photo-lineaments and mineral districts. Comparison of this plot with a plot of the mineral districts indicates that areas with a high frequency of intersections commonly coincide with known mineral districts. The results of this experiment suggest that photo-lineaments are fractures or fracture-controlled features, and their distribution may be a guide to metallic mineral deposits in Colorado, and probably other areas as well. Author

**N74-30764\*** Earth Satellite Corp., Washington, D.C.

### **RELATIONSHIP OF ROOF FALLS IN UNDERGROUND COAL MINES TO FRACTURES MAPPED ON ERTS-1 IMAGERY**

Charles E. Wier (Indiana Geological Survey), Frank J. Wobber, Orville R. Russell, Roger V. Amato, and Thomas V. Leshendok *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 825-843 refs

(Paper-G19) CSCL 08I

ERTS imagery is of unique value for mapping of certain fractures that are not identifiable on aircraft imagery. Because color infrared and ERTS imagery complement each other both sources of data were used to map fractures in western Indiana

and eastern Illinois. In the Kings Station Mine, Gibson County, Indiana, most roof falls reported had occurred in areas where mapped fractures were closely spaced and intersecting. Using this information as a basis for extrapolation, roof fall hazard maps were prepared for other mine sites. Various coal resources programs related to energy and environment also were conducted.

Author

**N74-30766\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**GEOLOGICAL EVALUATION AND APPLICATIONS OF ERTS-1 IMAGERY OVER GEORGIA**  
 S. M. Pickering and R. C. Jones *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 857-868

(Paper-G21) CSCL 08G

ERTS-1 70mm and 9 x 9 film negatives are being used by conventional and color enhancement methods as a tool for geologic investigation. Geologic mapping and mineral exploration by conventional methods is very difficult in Georgia. Thick soil cover and heavy vegetation cause outcrops of bed rock to be small, rare and obscure. ERTS-1 imagery, and remote sensing in general have helped delineate: (1) major tectonic boundaries; (2) lithologic contacts; (3) foliation trends; (4) topographic lineaments; and (5) faults. The ERTS-1 MSS imagery yields the greatest amount of geologic information on the Piedmont, Blue Ridge, and Valley and Ridge Provinces of Georgia where topography is strongly controlled by the bedrock geology. ERTS-1 imagery, and general remote sensing techniques, have provided us with a powerful tool to assist geologic research; have significantly increased the mapping efficiency of our field geologists; have shown new lineaments associated with known shear and fault zones; have delineated new structural features; have provided a tool to re-evaluate our tectonic history; have helped to locate potential ground water sources and areas of aquifer recharge; have defined areas of geologic hazards; have shown areas of heavy siltation in major reservoirs; and by its close interval repetition, have aided in monitoring surface mine reclamation activities and the environmental protection of our intricate marshland system.

Author

**N74-30768\*** Ministry of Public Works, Caracas (Venezuela).  
**GEOLOGICAL PHOTOINTERPRETATION OF THE PARAGUANA PENINSULA USING ERTS-A MULTISPECTRAL PHOTOGRAPHY**  
 Carlos Albrizio *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 883-896 refs

(Paper-G23) CSCL 08B

A methodology was developed to evaluate multispectral analysis of orbital imagery on the interpretation of geology, coastal geomorphology and sedimentary processes. The images analyzed were obtained during the pass of ERTS satellite over the center region of Venezuela on October 19, 1972. ERTS-1 multispectral images in black and white paper copies and transparencies of the 4 bands and false color composites at scales of 1:1,000,000 and 1:500,000 were interpreted. Lithology and outcrop patterns of the following geological formations have been interpreted: igneous and metamorphic basement of Cocodite and Santa Ana, Jurassic-Cretaceous metamorphics of Pueblo Nuevo, Cantaure Miocene-Pliocene sediments, and Quaternary alluvium, dunes, beach ridges, bars and reefs. A prominent and extensive Paraguana tonal anomaly shaped as an 8 has been discovered at the NW of the Peninsula. Its erosional origin has exposed light toned lower beds at the center, with additional evidence of topographic depression and development of underground drainage of karst origin. Coastal geomorphology, its processes and energy has been interpreted with the help of wind direction analysis (ENE-WSW) at sea level through the orientation of transported materials (water vapor, water and sediments) by clouds, waves, sea current, plumes of suspended sediments associated to river outlets, dunes, sediment sources and shore-line orientation.

Author

**N74-30769\*** Geological Survey of Alabama, University.  
**SIGNIFICANCE OF SELECTED LINEAMENTS IN ALABAMA**

James A. Drahovzal, Thornton L. Neathery, and Charles C. Wielchowsky *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 897-918 refs

(Paper-G24) CSCL 08F

Four lineaments in the Alabama Appalachians that appear on ERTS-1 imagery have been geologically analysed. Two of the lineaments appear to have regional geologic significance, showing relationships to structural and stratigraphic frameworks, water and mineral resources, geophysical anomalies, and seismicity. The other two lineaments are of local geologic significance, but, nevertheless, have important environmental implications.

Author

**N74-30770\*** Atomic Energy Establishment, Cairo (Egypt).  
**GEOLOGIC INTERPRETATION OF ERTS-1 SATELLITE IMAGES FOR WEST ASWAN AREA, EGYPT**  
 E. M. ElShazly, M. A. Abdel-Hady (Oklahoma State Univ.), M. A. ElGhawaby, and I. A. ElKassas *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 919-942 refs

(Paper-G25) CSCL 08G

ERTS-1 images of West Aswan area were interpreted in terms of geology, drainage, and structure. Twenty-two geological units were distinguished on ERTS-1 images in West Aswan area covering geological formations and erosional levels within some formations ranging from the Precambrian to the Quaternary. Apart from the distinction of Aswan monumental granite the investigated area shows very interesting exposures of sedimentary rocks ranging from the Cretaceous to the Quaternary. Of special interest is the delineation of the iron-ore member of the Nubian Sandstone and the phosphate-bearing formation. The tracing of the geological formations from south to north and the distinction of the varied geological units within the Pliocene and Quaternary, and the discussion on the origin of tufa are of particular significance. Also, the tracing on these images of major fractures and faults intercepting Aswan Dam Reservoir and their significance on the seepage and possible future development of diversion channels from reservoir is emphasized.

Author

**N74-30771\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**ERTS: A MULTISPECTRAL IMAGE ANALYSIS CONTRIBUTION FOR THE GEOMORPHOLOGICAL EVALUATION OF SOUTHERN MARACAIBO LAKE BASIN**  
 F. Salas, O. Cabello, F. Alarcon, and C. Ferrer *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 943-953

(Paper-G26) CSCL 08B

Multispectral analysis of ERTS-A images at scales of 1:1,000,000 and 1:500,000 has been conducted with conventional photointerpretation methods. Specific methods have been developed for the geomorphological analysis of southern Maracaibo Lake Basin which comprises part of the Venezuelan Andean Range, Perija Range, the Tachira gap and the Southern part of the Maracaibo Lake depression. A steplike analysis was conducted to separate macroforms, landscapes and relief units as well as drainage patterns and tectonic features, which permitted the delineation of tectonic provinces, stratigraphic units, geomorphologic units and geomorphologic positions. The geomorphologic synthesis obtained compares favorably with conventional analysis made on this area for accuracy of 1:100,000 scale, and in some features with details obtained through conventional analysis for accuracy of 1:15,000 and field work. Geomorphologic units in the mountains were identified according to changes in tone, texture, forms, orientation of interfluvies and tectonic characteristics which control interfluvial disimetrics.

Author

## 04 GEOLOGY AND MINERAL RESOURCES

**N74-30772\*** Bureau du President, Kinshasa (Zaire).  
**GEOLOGIC HYPOTHESES OF LAKE TANGANYIKA REGION, ZAIRE, DRAWN FROM ERTS IMAGERY**

Ulyera Wolyce and Sendwe Ilunga. In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 955-967

(Paper-G27) CSCL 08G

Based on initial work in the Lake Tanganyika area of eastern Zaire, it has been concluded that ERTS imagery is extremely useful for reconnaissance level geologic mapping and analysis in this region of the humid tropics. In particular, ERTS imagery has proven useful for recognizing and mapping regional structural units, for recognizing major structural features, and for arriving at some preliminary hypotheses about the mineral potential of the area. Results so far indicate that ERTS imagery can make a major contribution to the development of the mineral resources of the country. Research has concentrated on applications of ERTS imagery in the field of cartography, geology, forestry, hydrology and agriculture. For the work in geology, a test site was chosen in eastern Zaire on the shore of Lake Tanganyika in the vicinity of the Lukuga River. This area was selected because of its varied geology and the existence of two frames of cloud-free ERTS imagery. Author

**N74-30832\*#** National Aeronautics and Space Administration, Washington, D.C.

**GEOLOGICAL-PHYSIOGRAPHICAL EVALUATION OF ERTS IMAGES FROM AN AREA IN EASTERN BOLIVIA AND PARTS OF BRAZIL**

C. V. Flores Aug. 1974 6 p Transl. into ENGLISH from the Spanish

(NASA-TT-F-15857) Avail: NTIS HC \$4.00 CSCL 08G

Evaluations were made of ERTS-1 MSS band 7 imagery in order to find the best photointerpreting techniques for obtaining more geological-physiographical data. Conventional photointerpretation methods were used in the evaluation and results showed that these were satisfactory. Author

**N74-30835\*#** Long Island Univ., Greenvale, N.Y. Science Engineering Res. Group.

**PHOTOGRAPHIC TECHNIQUES FOR ENHANCING ERTS MSS DATA FOR GEOLOGIC INFORMATION Final Report, Jan. 1973 - Mar. 1974**

Edward Yost, William Geluso, and Robert Anderson 1 Apr. 1974 37 p refs Original contains color illustrations (Grant NGR-33-151-006)

(NASA-CR-139389; TR-23) Avail: NTIS HC \$5.00 CSCL 14E

Satellite multispectral black-and-white photographic negatives of Luna County, New Mexico, obtained by ERTS on 15 August and 2 September 1973, were precisely reprocessed into positive images and analyzed in an additive color viewer. In addition, an isoluminous (uniform brightness) color rendition of the image was constructed. The isoluminous technique emphasizes subtle differences between multispectral bands by greatly enhancing the color of the superimposed composite of all bands and eliminating the effects of brightness caused by sloping terrain. Basaltic lava flows were more accurately displayed in the precision processed multispectral additive color ERTS renditions than on existing state geological maps. Malpais lava flows and small basaltic occurrences not appearing on existing geological maps were identified in ERTS multispectral color images. Author

**N74-30847#** Joint Publications Research Service, Arlington, Va.

**SPACE PHOTOGRAPHIC SURVEYS IN GEOLOGICAL STUDIES**

2 Jul. 1974 248 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 (JPRS-62383) Avail: NTIS HC \$15.50

Articles on the utilization of space photographs of the earth are presented. Methods for the remote study of the earth for geological purposes are discussed. Some of the subjects included are: (1) deciphering tectonic lineaments by photographs, (2) scale distortions of a space photograph during its interpretation, (3) deciphering of deep structures and local uplifts, (4) hydrographic interpretations of photographs from space, and (5) the problem of the landscape method of deciphering space photographs.

**N74-30848** Joint Publications Research Service, Arlington, Va.  
**SIGNIFICANCE OF SPACE TECHNIQUES IN GEOLOGICAL STUDIES**

V. I. Sevastyanov, V. Ye. Khain, and V. A. Yarmolyuk. In its Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 1-6 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 3-7

Significant expansion of the mineral-raw material base of the country by increasing the effectiveness of the geological exploration operations in the economically developed regions and also in regions with high prospects are discussed. The development and fastest introduction of new methods of geological research permitting reliable forecasting of the location of deep-lying minerals have the greatest significance in the solution of these problems inasmuch as the surface deposits at the present time are almost exhausted in any case in the economically developed regions. One of the most effective forms of geological evaluation of broad territories is complex regional studies including the geological deciphering of the data provided by aerial and space photographic surveys. Author

**N74-30849** Joint Publications Research Service, Arlington, Va.  
**METHODS OF SPACE GEOLOGY**

V. K. Yeremin and Ya. G. Kats. In its Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 7-14 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 8-13

At the present time space geology has been equipped with remote methods of studying the structure of the earth's crust, as a rule, inherited from the practice of aerogeological research. These methods are based on using electromagnetic waves of different regions of the spectrum emitted, absorbed or reflected by natural objects. The multifrequency sounding of the earth's surface is the basis for remote space forms of research. Depending on the range of the applied electromagnetic oscillations, the following basic methods of space research are distinguished: (1) visual observations (0.4-0.7 microns); (2) photographic and television surveys (0.3-1.1 microns); (3) spectrometric surveying (0.3-3.0 microns); (4) infrared surveying (1.8-5.3 and 7-14 microns); (5) radar surveying (1 mm to 100 cm) and also magnetic, radiation, X-ray and other studies. Author

**N74-30850** Joint Publications Research Service, Arlington, Va.  
**DEVELOPMENT OF A METHOD OF GEOLOGICAL DECIPHERING OF SPACE IMAGES OF THE EARTH**

V. G. Trifonov. In its Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 15-21 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 3, 1973 p 14-18

For the modern stage of the development of geology, finding the most general, planetary laws of geological processes is characteristic. In the development of this scientific area an important role must be played by the geological study of the earth using deciphering and interpretation of space images of the earth's surface. The space photographs permit us to discover the spatial relations between the geological phenomena, large structures and elements of the structures over a large area. The information contained on the photographs does not

depend on the accessibility and degree to which the regions have been studied. This is highly significant for the comparison and discovery of the relative role of certain formations. The photographs obtained from the Soviet spacecraft are of special interest inasmuch as they encompass latitudes to 50 degrees. For purposes of geological deciphering, the images of the Caucasus, the mountainous regions of Central Asia and Kazakhstan, the Turan depression, the Kazakhstan hummocky area, Altay and the southern framework of the eastern Siberian highland. Author

**N74-30852** Joint Publications Research Service, Arlington, Va. **STUDY OF THE DISCONTINUOUS TECTONICS BY A SET OF PHOTOGRAPHS OF THE EARTH OF DIFFERENT SCALE TAKEN FROM SPACE (THE MULTISTEP GENERALIZATION METHOD)**

V. D. Skaryatin *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 41-61 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 34-50

The requirement for studying the fractures of the earth's surface is discussed. The method of multistep generalization for application to the study of discontinuous tectonics is described. The method is based on the fact that each scale of the survey has a specific volume of geological information. This implies the necessity of complex application of photographs of different scale to obtain the most complete representation of the geological subjects. The possibility of using space photographs of the earth for different types of geological studies is considered. Author

**N74-30853** Joint Publications Research Service, Arlington, Va. **DECIPHERING TECTONIC LINEAMENTS BY PHOTOGRAPHS OF THE CAUCASUS FROM SPACE**

S. L. Vyzova, M. L. Kopp, N. N. Kurdin, L. M. Rastsvetayev, and V. G. Trifonov *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 62-75 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 51-61

The space photographs obtained on the Soyuz-9 spacecraft (the scale of the original negatives was 1:6,000,000 to 1:8,000,000) are discussed. These images encompass two belts of northeasterly strike, one of which extends from Batumi to Derbent, and the other runs along the western shore of the southern Caspian. When studying the black and white space photographs of the Caucasus, it is possible to detect linear formations, many of which are not reflected on the geological and tectonic maps compiled earlier. These structures are distinguished on the space photographs by color from the adjacent sections or they are sharp boundaries of fields with different intensity of photographic background. Frequently they correspond to the specific forms of relief: the straight valleys or sections of different valleys located one as a continuation of the other, the scarps in the relief and the boundaries of the zones with different style of relief and nature of erosion dismemberment. Author

**N74-30854** Joint Publications Research Service, Arlington, Va. **ROLE OF SPACE PHOTOGRAPHS IN SOLVING THE PROBLEMS OF THE REGIONAL TECTONICS OF THE SOUTHEASTERN PART OF THE CAUCASUS**

V. Z. Sakhatov *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 76-82 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 62-66

Photographs of the earth's surface taken in different bands of the visible part of the spectrum are discussed. The problems which are to be solved by space photographs of the earth include the following: (1) the discovery of new and the more precise definition of the known regional structures, (2) the discovery of the possibility of tracing the hidden structures, and (3) analysis of the deep structure of the territories by interpreting the images

from space photographs. On this level, the southeastern caucasus is of special interest in proving the use of space photographs as one of the best studied regions of the Soviet Union. Author

**N74-30855** Joint Publications Research Service, Arlington, Va. **INTERPRETABILITY OF TECTONIC STRUCTURES OF REGIONS OF YOUNG EPIPLATFORM MOUNTAIN FORMATION ON SPACE PHOTOGRAPHS OF THE EARTH (IN THE EXAMPLE OF THE SOUTHWESTERN TIEN SHAN)**

V. I. Makarov *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 83-91 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 67-74

The Tien Shan is one of the key regions for studying the feasibility of using images of the earth obtained from space for studying the tectonics of young epiplatform mountain structures. It has been relatively well investigated in geological respects and is registered on space photographs of different scales. The latter circumstance, in addition to making it possible to evaluate the resolution of photographs at different scales, makes it possible to carry out their comparative analysis and thereby ascertain the difference in scale of tectonic formations and to determine objectively their subordination or rank. The Tien Shan is among the regions where the most recent tectonic movements (Pg-Q) are manifested particularly clearly and have attained great amplitudes and contrast. They occupied an area whose geosynclinal development was already completed by the end of the Paleozoic and which then over a long period (Mz-Kz1) developed in a regime close to a platform regime. Accordingly, three structural stages and their corresponding formations participate in the complex geological structure of the Tien Shan. Author

**N74-30856** Joint Publications Research Service, Arlington, Va. **USE OF SPACE PHOTOGRAPHS TO STUDY THE TECTONICS OF THE SAHARA PLATFORM**

D. M. Trofimov *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 92-99 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 75-84

The interpretation of photographic and television imagery of the Sahara Platform is discussed. The studies are based on imagery received from unmanned satellites and Gemini flights. Additional photography from the Zond-5 automated station was included in the study. The geological materials produced geological and tectonic maps of Africa on a scale of 1:5,000,000. An analysis of the geographical and geological features of various African regions is developed. Author

**N74-30857** Joint Publications Research Service, Arlington, Va. **CONSIDERATION OF THE SCALE DISTORTIONS OF A SPACE PHOTOGRAPH DURING ITS INTERPRETATION**

G. B. Gonin and L. I. Pogodina *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 100-104 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 81-84

The effects of scale distortions on the accuracy of photointerpretation of space photography are discussed. The information about the scale of the image in various parts of the space photograph can be useful when determining the dimensions of the deciphered objects. The numerical basis for solving scale problems of space photography is analyzed. Mathematical models are developed to show the relationships of the parameters. Systems of coordinates for determining the scale of the space photograph are reported. Author

## 04 GEOLOGY AND MINERAL RESOURCES

**N74-30858** Joint Publications Research Service, Arlington, Va. **MEAN CHEMICAL COMPOSITION AND ORIGIN OF THE GRANITE AND BASALT SHELLS OF THE LITHOSPHERE** A. A. Beus *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 105-113 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), no. 7, 1973 p 85-91

The mean chemical composition of the granite shell of the lithosphere was calculated as the mean for 65 regions of the earth on the basis of the statistically calculated mean compositions of all the principal types of magmatic and metamorphic rock. The estimates of the mean propagation of various types of rock were obtained by measuring the areas on 12 small-scale geological maps which are the typical regions of Europe, Asia, Africa, North and South America. In estimating the chemical composition of the basalt shell, the available experimental data on the density of a number of rocks were used, the presence of which can be assumed under the conditions of the granulitic and eclogitic zones of metamorphism, along with the seeds of transmission in them of longitudinal seismic waves at high pressures characteristic of these zones of metamorphism. Author

**N74-30859** Joint Publications Research Service, Arlington, Va. **BASIC TRENDS IN THE DEVELOPMENT OF COLLECTIVE RECRYSTALLIZATION IN VEINED GRANITES** Yu. B. Marin *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 114-120 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), no. 7, 1973 p 92-96

The role of recrystallization in the formation of pegmatites is discussed. The application of crystallization theory to the formation of granite structures is developed. The effects of temperature variation and variation in the chemistry of the solutions causing a different course of the recrystallization process are analyzed. The classification of intragranite pegmatites in shallow depth formations is explained. Author

**N74-30860** Joint Publications Research Service, Arlington, Va. **STRUCTURE OF THE TURAN PLATFORM BY THE DATA FROM COMPLEX INTERPRETATION OF THE GEOLOGICAL-GEOPHYSICAL AND COSMOGEOLOGICAL STUDIES (IN CONNECTION WITH THE PROSPECTS OF OIL AND GAS BEARING)**

S. M. Bogorodskiy, V. P. Gabrilov, L. G. Kiryukhin, and M. T. Kozitskaya *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 121-139 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), no. 7, 1973 p 97-111

The practical use of the information obtained during space surveys combined with the materials of geological-geophysical studies to decode the structure of the Turan platform is discussed. The study of the structure of the Turan platform which is a tectonic type of young platform is not only of theoretical interest but also practical interest inasmuch as numerous deposits of different types of mineral composition are connected with it, and oil and gas primarily. The distribution of the latter in many cases, as is known, is controlled by structural-tectonic factors. Therefore, in decoding the deep geological structure of the platform regions, the geophysical methods occupy the leading place: magnetic and gravimetric, electric and seismic prospecting. However, the effectiveness of these methods can be appreciably improved by combining them with cosmogeological observations. Author

**N74-30861** Joint Publications Research Service, Arlington, Va. **DECIPHERING THE DEEP STRUCTURE AND LOCAL UPLIFTS BY SPACE PHOTOGRAPHS OF THE TURAN PLATFORM**

P. V. Florenskiy *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 140-147 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), No. 7, 1973 p 112-117.

The interpretation of spaceborne photography to decipher the deep structure and local uplifts of the Turan Platform in Russia is discussed. The geological aspects of the Turan Platform are described. The conclusions which have been reached as a result of analyzing the space photography are reported. An important part of the survey is the determination that local uplifts which contain gas and oil deposits are reflected on the photographs. Author

**N74-30862** Joint Publications Research Service, Arlington, Va. **PROSPECTS OF THE APPLICATION OF MATERIALS FROM SPACE SURVEYS FOR HYDROGEOLOGICAL RESEARCH** I. K. Abrosimov and Ye. A. Vostokova *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 148-161 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), No. 7, 1973 p 118-128.

The application of spaceborne photography and aerial surveys for hydrogeological purposes is discussed. The factors and components of the topography which assist in identifying hydrogeologic resources are identified. The application of the photographs for hydrogeological research includes two interrelated processes: (1) the establishment of the relation of the ground water to the physionomic components of the landscape and the morphostructural conditions, and (2) the determination of the deciphering attributes of these groundwater indicators. Specific examples of hydrogeological research are reported based on various types of photographic recordings. Author

**N74-30865** Joint Publications Research Service, Arlington, Va. **SPECIAL METHODS FOR THE REMOTE STUDY OF THE EARTH FOR GEOLOGICAL PURPOSES** A. G. Ryabukhin *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 177-190 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), No. 7, 1973 p 140-149

The various methods for conducting remote investigations of geological formations are described. The methods considered are: (1) spectrometric survey of electromagnetic radiation of natural features, (2) infrared spectrometry to determine temperature inhomogeneities of the radiation surface, and (3) microwave spectrometric sensing based on radiobrightness temperature caused by nonuniformity of the radiation coefficient of natural formations. Specific examples of the application of the types of sensors are included. Author

**N74-30866** Joint Publications Research Service, Arlington, Va. **POSSIBILITIES OF USING SPACE INFRARED PHOTOGRAPHS OBTAINED FROM THE METEOR SATELLITE SYSTEM IN GEOLOGY (IN THE EXAMPLE OF EASTERN KAZAKHSTAN)**

V. Z. Sakhatov, N. V. Skublova, and N. A. Yakovlev *In its Space Phot. Surv. in Geol. Studies* (JPRS-62383) 2 Jul. 1974 p 191-199 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved.* (Moscow), No. 7, 1973 p 150-156

The use of infrared imagery obtained by artificial earth satellites in conducting geological surveys is discussed. The characteristics of the radiometers used for infrared sensing are described. Specific applications of the infrared sensing technique to volcanic activity and geological formations are reported. Spaceborne photographic imagery and infrared imagery are compared to show areas of similarity. The analysis of anomalies as a method of identifying terrestrial objects is explained. Author

**N74-30867** Joint Publications Research Service, Arlington, Va.  
**PROCEDURE FOR DETERMINING THE COORDINATES OF CAVITIES WITH ICELAND SPAR**

V. G. Semenov, N. N. Sokolov, and V. V. Chebykin *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 200-208 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, No. 7, 1973 p 157-163

The procedure for determining the coordinates of the cavities of Iceland spar is described. The operating principle of the equipment is based on the reflection of short ultrasonic pulses from the sharply different acoustic boundaries. The depth of the penetration of the pulses is determined by the power of the radiation and the sensitivity of the receiver. A diagram of the ultrasonic generator is provided. Mathematical models are developed to show the relationships of the parameters. Curves are shown which depict the type of data received from surveys conducted with the test equipment. Author

**N74-30868** Joint Publications Research Service, Arlington, Va.  
**PECULIARITIES OF DRILLING BOREHOLES WITH INTENSE DISTORTION**

B. F. Golovchenko *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 209-215 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, No. 7, 1973 p 164-169

Drilling techniques for geological exploration are discussed. A numerical analysis of drilling displacements is developed. The equipment used for various types of drilling operations is described. A diagram of the distortion of a well by drilling from a scarp is provided. Specific examples of wells that were drilled under various conditions are reported. Author

**N74-30869** Joint Publications Research Service, Arlington, Va.  
**THEORETICAL AND EXPERIMENTAL STUDIES OF THE EXHAUST SYSTEM OF A MOTORIZED DRILL**

N. B. Ostapenko, V. V. Alekseyev, and I. P. Soldatov *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 216-225 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, no. 7, 1973 p 170-177

In the underground mines it is necessary to deal with the problem of the removal of exhaust gases to the mouth of the adit or shaft, which is realized by means of durite or metal exhaust pipes. Since the exhaust of the gases from the cylinder of an internal combustion engine takes place periodically, the exhaust system of the drill must have fluctuations of the column of gas in the exhaust pipe. These fluctuations can have a strong effect on the basic operating parameters of the engine (power, counterpressure at the exhaust, torque, rpm, and so on). Theoretical studies of the effect of the oscillatory processes in the exhaust system of a motorized drill on the basic engine parameters are presented. Author

**N74-30871** Joint Publications Research Service, Arlington, Va.  
**CONCENTRIC ARCH STRUCTURES IN THE EASTERN PART OF THE TURAN PLATFORM ON PHOTOGRAPHS FROM SPACE**

S. S. Shults *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 230-233 Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, no. 7, 1973 p 182-184

Remote studies of the earth from space have to a great extent permitted a new representation of the structure of the continents and detection of previously unknown structures of the continental crust. One of the most interesting and unexpected results of deciphering the space photographs was the detection in various parts of the continents of a large number of concentric structures from several kilometers to hundreds of kilometers in diameter. These structures are especially well traced on the

shields of the ancient and young platforms and in the regions of shallow (1-2 km from the surface) occurrence of the basement under the platform mantle. The series of concentric structures frequently imbedded one in the other is clearly deciphered on the photographs of the eastern part of the Turan platform taken from space within the limits of the Kyzylkumy Desert, the Southeastern and Eastern Priaral'ye (Aral region), the lower and middle courses of the Syrdar'ya River. Author

**N74-30872** Joint Publications Research Service, Arlington, Va.  
**ALGAE-LIKE MICROFOSSILS IN THE ARCHEAN ROCK OF SOUTH INDIA**

A. S. Lopukhin and V. M. Moralev *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 234-238 refs Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, no. 7, 1973 p 185-187

Samples collected in two regions in South India from the series which are the most ancient on the Hindustan shield were subjected to micropaleontologic investigation. Studies were made of the organic remains from the graphite gneisses entering into the complex of metamorphic rock more ancient pre-Darwar complex has an age of more than 3000 million years. The new definitions of the absolute age of the rock in this complex of primarily hornblende-biotitic and hornblende and also charnockite gneisses, give figures from 2800-2900 to 3130-3205 million years. The graphite gneisses combined with the pre-Darwar complex are encountered rarely, but in places they are made up of sustained beds stretching kilometers with a thickness of 5-10 meters. The investigated sample was taken in the Sivagang deposit located south of Madurai in the southern part of Tamil-Nadu (formerly the state of Madras). Author

**N74-30873** Joint Publications Research Service, Arlington, Va.  
**NEW TEXT ON CRIMEAN GENERAL GEOLOGICAL PRACTICE**

L. A. Ragozin and Ya. G. Kats *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 239-242 Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, no. 7, 1973 p 188-189

The geological characteristics of the Crimea are presented. The subjects discussed are: (1) the geological structure, (2) geological processes of weathering, eolian activity, gravitational, and karstic processes, and (3) an analysis of river erosion, marine abrasion, earthquakes, and oscillatory movements. A guide for geological tours of the Crimea is provided based on actual experiences of the author. Specific examples of geological structure and weathering for selected areas of the Crimea are described. Author

**N74-30874** Joint Publications Research Service, Arlington, Va.  
**PROBLEM OF THE LANDSCAPE METHOD OF DECIPHERING SPACE PHOTOGRAPHS (SEMINAR ON THE GEOGRAPHIC DECIPHERING OF SPACE PHOTOGRAPHS AT THE GEOGRAPHY DEPARTMENT OF MOSCOW STATE UNIV.)**

T. P. Onufriyuk *In its Space Phot. Surv. in Geol. Studies (JPRS-62383)* 2 Jul. 1974 p 243-245 Transl. into ENGLISH from *Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow)*, no. 7, 1973 p 190-191

The proceedings of a seminar on the geographic decoding of space photographs are presented. The geographic studies used to determine the deciphering attributes for the space photographs which are of definite interest for geological deciphering are discussed. The experiences of various investigators in deciphering spaceborne photography are reported. Applications of space photography for soil science and vegetation growth are emphasized. Author

## 04 GEOLOGY AND MINERAL RESOURCES

**N74-30862#** Bureau of Mines, Laramie, Wyo.

### **METHODS FOR REFINING CRUDE SHALE OIL PRODUCED BY IN SITU RETORTING**

Clyde M. Frost and Philip L. Cottingham Jan. 1974 27 p refs  
(PB-229217/5; BM-RI-7844) Avail: NTIS HC \$3.25 CSCL 08I

Crude shale oil produced during in situ combustion retorting experiments by the Bureau of Mines at Rock Spring, Wyoming, was refined by three different processing schemes. The crude oil was fractionated to raw naphtha and 400 F plus residuum in the first experiment. The 400 F plus residuum was hydrogenated over cobalt molybdate catalyst at 815 F and 1,100 psig. An aliquot blend of the raw naphtha and 160 F to 400 F hydrogenated naphtha was hydrogenitrified and then catalytically reformed. The 400 F plus hydrogenated oil was catalytically cracked. The total crude was hydrogenated over nickel-tungsten catalyst at 800 F and 1,500 psig in the second scheme. The third scheme was similar to the second except that prior to the hydrogenation step, the total crude was hydrostabilized over cobalt molybdate at 500 F and 500 psig. (Modified author abstract) GRA

**N74-31786\*#** National Center for Earthquake Research, Menlo Park, Calif.

### **DEVELOPMENT AND EVALUATION OF A PROTOTYPE GLOBAL VOLCANO SURVEILLANCE SYSTEM UTILIZING THE ERTS-1 SATELLITE DATA COLLECTION SYSTEM Final Report, Jun. 1972 - Feb. 1974**

Jerry P. Eaton, Principal Investigator, Peter L. Ward, Elliot T. Endo, David H. Harlow, Rex Allen, and Dan Marquez Feb. 1974 168 p refs ERTS  
(NASA Order S-70243-AG-2)  
(E74-10689; NASA-CR-139222) Avail: NTIS HC \$11.50 CSCL 08F

**N74-31796\*#** Bendix Corp., Ann Arbor, Mich. Systems Div.  
**AUTOMATIC MAPPING OF STRIP MINE OPERATIONS FROM SPACECRAFT DATA**

Robert H. Rogers, Principal Investigator, Larry E. Reed, and Wayne A. Pettyjohn (Ohio State Univ.) Aug. 1974 17 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21762)  
(E74-10715; NASA-CR-139547) Avail: NTIS HC \$4.00 CSCL 08B

The author has identified the following significant results. Computer techniques were applied to process ERTS tapes acquired over coal mining operations in southeastern Ohio on 21 August 1972 and 3 September 1973. ERTS products obtained included geometrically-correct map overlays, at scales from 1:24,000 to 1:250,000, showing stripped earth, partially reclaimed earth, water, and natural vegetation. Computer-generated tables listing the area covered by each land-water category in square kilometers were also produced. By comparing these mapping products, the study demonstrates the capability of ERTS to monitor changes in the extent of stripping and reclamation. NASA C-130 photography acquired on 7 September 1973 when compared with the ERTS products generated from the 3 September 1973 tape established the categorization accuracy to be better than 90%. It is estimated that the stripping and reclamation maps and data were produced from the ERTS CCTs at a tenth of the cost of conventional techniques.

**N74-31801\*#** Geological Survey, Reston, Va.  
**IRON-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES Progress Report, 1 Mar. - 30 Apr. 1974**

Lawrence C. Rowan, Principal Investigator and Pamela H. Wetlaufer 30 May 1974 10 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(NASA Order S-70243-AG-4)

(E74-10720; NASA-CR-139552) Avail: NTIS HC \$4.00 CSCL 08G

**N74-31804\*#** Geological Survey, Reston, Va.

### **SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND Progress Report, 1 Mar. 1974 - 30 Apr. 1974**

Richard S. Williams, Jr., Principal Investigator 1 May 1974 8 p refs ERTS

(NASA Order S-70243-AG)

(E74-10723; NASA-CR-139556) Avail: NTIS HC \$4.00 CSCL 08G

The author has identified the following significant results. Most of the research emphasis was directed at the analysis of Icelandic icecaps on ERTS imagery. A number of new findings were made, including: (1) on low sun angle imagery of Hofsjokull, the outline of a probable central volcano can be seen delineated on the northwest part of the icecap; (2) on low sun angle imagery of Langjokull, two parallel hyaloclastite ridges can be seen to continue for more than 10 km in from the margin of the icecap; (3) measurements of contorted medial moraines on images of Skeioarajokull, acquired about 11 months apart show an approximate 600 m of annual glacier movement; (4) measurements on images of the surging glacier, Eyjabakkajokull, taken about 11 months apart show an approximate 1.8 km of movement during that time; and (5) successive ERTS images of the glacier-dammed lake, Graenalon, show an increase in area of the lake until the ice dam was partially breached, causing a jokulhlaup across the Skeioararsandur. Because of the shape of the lake basin the elevation of the post-jokulhlaup lake can be determined from ERTS imagery to + or - 2 m.

**N74-31806\*#** Geological Survey, Reston, Va. Branch of Eastern Mineral Resources.

### **THE USE OF ERTS-1 IMAGES IN THE SEARCH FOR LARGE SULFIDE DEPOSITS IN THE CHAGAI DISTRICT, PAKISTAN Final Report, 1 Jan. - 31 Dec. 1973**

Robert G. Schmidt, Principal Investigator 1 May 1974 38 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(NASA Order S-70243-AG)

(E74-10726; NASA-CR-139572) Avail: NTIS HC \$5.00 CSCL 08G

The author has identified the following significant results. Visual examination of color composites was tested under relatively ideal conditions for direct detection of large hydrothermal sulfide deposits at the low-grade porphyry copper deposit at Saindak, western Chagai District, Pakistan. The Saindak deposit is characterized by an elongate zone of easily eroded sulfide-rich rock surrounded by a resistant rim of hornfels and propylitically altered rock. The geomorphic features related to the Saindak deposit are easily distinguished on ERTS-1 images. Attempts to detect a color anomaly using false-color composites were not successful. About 36,000 square km of the western Chagai District were examined on false-color composites for direct evidence of large sulfide deposits. New geologic information acquired from the images was used in conjunction with the known geology to evaluate two previously known proposed areas and to suggest seven additional targets for field checking, one of which is proposed on the basis of tonal anomaly alone. The study also showed that Saindak-type deposits are not likely to be present in some extensive areas of the Chagai District; and also that a rim like that at Saindak does not form if regional metamorphism has increased the resistance of the country rock to erosion.



**N74-31810\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM** Quarterly Report, 8 Mar. - 8 Jun. 1974

Robert K. Vincent, Principal Investigator 24 Jun. 1974 26 p refs EREP

(Contract NAS9-13317)

(E74-10732; NASA-CR-139578; ERIM-102000-22-L) Avail: NTIS HC \$4.50 CSCL 08B

**N74-31811\*#** Alabama Univ., Huntsville. School of Graduate Studies and Research.

**STUDY TO DEFINE POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS IN LIMESTONE AQUIFERS** Final Report

F. L. Doyle 21 Nov. 1973 10 p

(Contract NAS8-30216)

(NASA-CR-120322) Avail: NTIS HC \$4.00 CSCL 08H

Visual examinations of both prints and transparencies from ERTS 1 and U-2 aircraft imagery provided a method for discovering possible points of entry of potential contaminants into the limestone aquifer in Madison County, Alabama. Knowledge of the locations at which contaminants could enter the aquifer is an important consideration in water quality management, particularly for regions that depend, at least partially, on ground water for their water supply. ERTS 1 imagery recorded on December 28, 1972 in the Multispectral Scanner-5 (MSS-5) and MSS-7 bands, and a false-color composite of the MSS-4 (green), MSS-5 (red), and MSS-7 (near infrared) bands were the principal materials used, along with thermography recorded by an RS-7 infrared scanner onboard a U-2 aircraft. The results of the study are discussed in detail, providing information on prominent lineations and major fracture trends which are related to aquifer contamination. Maps depicting the observations are also presented. A.A.D.

**N74-31860\*#** Scientific Translation Service, Santa Barbara, Calif. **QUALITATIVE AND QUANTITATIVE EVALUATION OF AN ERTS IMAGE (NASA 1005-13335). AREA: HUANCHACA, SANTA CRUZ COUNTY, EASTERN BOLIVIA**

L. J. Pareja Washington NASA Aug. 1974 10 p Transl. into ENGLISH of "Evaluacion Cualitativa y Cuantitativa de una Imagen ERTS (NASA 1005-13335). Area: Huanchaca, Departamento Santa Cruz, Oriente de Bolivia" Original contains color illustrations

(Contract NASw-2483)

(NASA-TT-F-15858) Avail: NTIS HC \$4.00 CSCL 08B

Qualitative and quantitative evaluations of ERTS satellite images of an area in eastern Bolivia have been made by the Bolivian Geological Service. The main objective of the photointerpretation analysis was to assess the information to be obtained from a diazo false color composition obtained from the conjunction of three images in the MSS bands 4, 5, and 7, reproduced in the primary colors known in the color film as cyan, magenta, and yellow. Author

**N74-32789\*#** Sheffield Univ. (England). Dept. of Geography. **HYDRO-GEOLOGICAL DATA FROM SKYLAB EREP IMAGERY OF THE MURCIA PROVINCE, S. E. SPAIN**

J. L. VanGenderen, Principal Investigator Aug. 1974 38 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(E74-10740; NASA-CR-139630) Avail: NTIS HC \$5.00 CSCL 08B

**N74-32770\*#** Institut Francais du Petrole, Rueil-Malmaison. **TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE)** Progress Report, Apr. - May 1974

Jacques Guillemot, Principal Investigator Jun. 1974 4 p Sponsored by NASA EREP

(E74-10743; NASA-CR-139983; PR-3) Avail: NTIS HC \$4.00 CSCL 08G

**N74-32776\*#** Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.

**MULTISPECTRAL PHOTOGRAPHY OF ITALIAN VOLCANIC ACTIVITY, VEGETATION, AND PALEO RIVER BEDS** Progress Report

R. Cassinis, Principal Investigator, G. M. Lechi, C. M. Marino, and A. M. Tonelli 9 May 1974 3 p Sponsored by NASA EREP

(E74-10750; NASA-CR-139990; PR-1) Avail: NTIS HC \$4.00 CSCL 08F

**N74-32777\*#** Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.

**MINERAL EXPLORATION AND GEOLOGY APPLICATIONS OF ERTS-1, EREP, AND RB-57F IMAGERY AND PHOTOGRAPHY OF THE UTAH - NEVADA AREA** Quarterly Progress Report, 1 May - 31 Jul. 1974

Mead LaRoy Jensen, Principal Investigator and Phillip Laylander 14 Jun. 1974 63 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-13322)

(E74-10751; NASA-CR-139991) Avail: NTIS HC \$6.25 CSCL 08G

**N74-32785\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**AN ANALYSIS OF FRACTURE TRACE PATTERNS IN AREAS OF FLAT-LYING SEDIMENTARY ROCKS FOR THE DETECTION OF BURIED GEOLOGIC STRUCTURE**

Melvin H. Podwysocki Jun. 1974 85 p refs Submitted for publication

(NASA-TM-X-70742; X-923-74-200) Avail: NTIS HC \$7.25 CSCL 08G

Two study areas in a cratonic platform underlain by flat-lying sedimentary rocks were analyzed to determine if a quantitative relationship exists between fracture trace patterns and their frequency distributions and subsurface structural closures which might contain petroleum. Fracture trace lengths and frequency (number of fracture traces per unit area) were analyzed by trend surface analysis and length frequency distributions also were compared to a standard Gaussian distribution. Composite rose diagrams of fracture traces were analyzed using a multivariate analysis method which grouped or clustered the rose diagrams and their respective areas on the basis of the behavior of the rays of the rose diagram. Analysis indicates that the lengths of fracture traces are log-normally distributed according to the mapping technique used. Fracture trace frequency appeared higher on the flanks of active structures and lower around passive reef structures. Fracture trace log-mean lengths were shorter over several types of structures, perhaps due to increased fracturing and subsequent erosion. Analysis of rose diagrams using a multivariate technique indicated lithology as the primary control for the lower grouping levels. Groupings at higher levels indicated that areas overlying active structures may be isolated from their neighbors by this technique while passive structures showed no differences which could be isolated. Author

## 04 GEOLOGY AND MINERAL RESOURCES

**N74-33159\*#** Kanner (Leo) Associates, Redwood City, Calif.  
**NUCLEAR PROSPECTORS OF EARTH AND SPACE OBJECTS**

Ye. M. Filippov Washington NASA Sep. 1974 156 p refs  
Transl. into ENGLISH of the book "Yadernyye Razvedchiki Zemnykh i Kosmicheskikh Obyektov" Novosibirsk, Nauka Press, 1974 p 1-138

(Contract NASw-2481)

(NASA-TT-F-15140) Avail: NTIS HC \$11.00 CSDL 20H

Nuclear geophysics is reviewed beginning with a treatment of the distribution of radioactive elements in the land, sea, and meteorites. Nuclear unmanned prospecting landers intended for use on Mars, Venus, the Moon, and Jupiter are described. Nuclear densimeters, moisture meters, specialized element detectors, well-logging devices, neutron and X-ray tubes are described as developed in the U.S.S.R. and abroad. Particle accelerators as applied in geophysics and geology are discussed. Author

**N74-33818\*#** Institut Francais du Petrole, Rueil-Malmaison.  
**TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE)** Progress Report, Dec. 1973 - Jan. 1974

Jacques Guillemot, Principal Investigator Feb. 1974 7 p  
Sponsored by NASA EREP

(E74-10741; NASA-CR-139981) Avail: NTIS HC \$4.00 CSDL 08G

**N74-33819\*#** Institut Francais du Petrole, Rueil-Malmaison.  
**TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE)** Progress Report, Feb. - Mar. 1974

Jacques Guillemot, Principal Investigator Apr. 1974 9 p  
Sponsored by NASA EREP

(E74-10742; NASA-CR-139982) Avail: NTIS HC \$4.00 CSDL 08G

**N74-33823\*#** Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.

**SKYLAB IMAGERY OF CENTRAL AMERICAN VOLCANOES**  
Progress Report, Feb. - Apr. 1974

Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technological Univ.) Aug. 1974 4 p EREP  
(Contract NAS9-13311)

(E74-10755; NASA-CR-139995) Avail: NTIS HC \$4.00 CSDL 08F

The author has identified the following significant results. The size and intensity of the Izalco volcano thermal anomaly, which were increasing between July and December 1973, have not increased in the January-April 1974 period. Volcanic activity at Pacaya volcano, Guatemala was very prominent during the quarter. Details of the activity are being collected and assembled.

**N74-33824\*#** Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.

**SKYLAB IMAGERY OF CENTRAL AMERICAN VOLCANOES**  
Progress Report, May - Jul. 1974

Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technological Univ.) Sep. 1974 4 p EREP  
(Contract NAS9-13311)

(E74-10756; NASA-CR-139996) Avail: NTIS HC \$4.00 CSDL 08F

**N74-33876\*** National Aeronautics and Space Administration.  
Goddard Space Flight Center, Greenbelt, Md.

**MINERAL RESOURCES, GEOLOGICAL STRUCTURE, AND LANDFORM SURVEYS**

Nicholas M. Short In its 3rd ERTS Symp., Vol. 3 May 1974 p 33-51 refs

CSDL 08G

Diagnostic ERTS imagery has been used to pinpoint surface conditions associated with known mining districts. These include enhancements which depict hitherto unrecognized surface alteration and allow analysis of ore-controlling fractures distribution in a regional context. ERTS has likewise provided observational data containing previously unrecognized surface anomalies in large oil-producing basins which correlate closely with known oil fields. These observational data offer promise of providing new and powerful techniques for oil exploration, especially if further work using more sophisticated enhancement-processing proves capable of emphasizing the anomalies. ERTS is showing a better-than-anticipated potential for producing accurate small-scale (large-area) geologic maps, often containing details that were previously not recorded on similar regional maps. The maps produced from ERTS imagery can be prepared more effectively than previously possible, mainly because of the synoptic, multispectral, and repetitive character of ERTS data. ERTS has also provided extensive information on possible geologic hazards. Many new fractures have been identified in several regions of the Pacific Coast seismic belt that have histories of recent earthquakes. This has obvious implications for engineering projects such as dams, aqueducts, and transportation routes. In the mid-continent area, ERTS data have been used to predict zones of rooftop danger in a working coal mine from newly discovered lineations (probably fractures) used as indicators of hazards. Author

**N74-34732\*#** Argus Exploration Co., Los Angeles, Calif.

**A RECONNAISSANCE SPACE SENSING INVESTIGATION OF CRUSTAL STRUCTURE FOR A STRIP FROM THE EASTERN SIERRA NEVADA TO THE COLORADO PLATEAU**  
Final Report

Mark A. Liggett, Principal Investigator Aug. 1974 478 p refs  
Original contains color illustrations. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21809)

(E74-10705; NASA-CR-139434) Avail: NTIS HC \$27.00 CSDL 08G

The author has identified the following significant results. Studies were conducted in key field areas in the Sierra Nevada, the Basin Range Province and the Colorado Plateau to evaluate the origins and significance of geologic and structural anomalies expressed in the ERTS-1 data. The investigation included development of image enhancement and analysis techniques and comparison of remote sensing data available over the test site. The ERTS-1 MSS imagery has proven to be an effective tool for studying the interrelationships between Cenozoic tectonic patterns and the distributions of Cenozoic plutonism and volcanism, seismic activity, geologic hazards, and known mineral, geothermal and ground water resources. Recommendations are made for applications of ERTS-1 data to natural and resource exploration and management.

**N74-34739\*#** North Carolina State Univ., Raleigh. Dept. of Geosciences.

**UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA**  
Quarterly Progress Report, Jun. - Aug. 1974

Charles W. Welby, Principal Investigator 27 Sep. 1974 2 p EREP

(Contract NAS9-13321)

(E74-10772; NASA-CR-140125) Avail: NTIS HC \$3.25 CSDL 08B

**N74-34741\*#** Institut Francais du Petrole, Rueil-Malmaison.  
**PROJECT PYRALP: TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE)**

**Progress Report, Jun. - Jul. 1974**

Jacques Guillemot, Principal Investigator Aug. 1974 19 p refs  
 Sponsored by NASA EREP

(E74-10774; NASA-CR-140127; PR-4) Avail: NTIS  
 HC \$3.25 CSCL 08G

The author has identified the following significant results. In the Eastern Aquitaine Basin in southern France, investigations using SL 3 photographs from an S190A camera reveal a slight line joining a Paleozoic trend of the Montagne Noire massif to a more recent Pyrenean fault zone of Cretaceous to Tertiary age. According to the interpretation of this line as the superficial geomorphological trace of a deep-seated fault zone, Hercynian weakness lines appear to have played a more important part than previously thought in the building of the Pyrenean range. The Lezat line is a trend of small morphological features obvious only in the photographs having the highest resolution.

**N74-34742\*#** Consiglio Nazionale delle Ricerche, Milan (Italy).  
 Lab. per la Geofisica della Litosfera.

**CONTRIBUTION OF SKYLAB MULTISPECTRAL IMAGERY TO THE REMOTE SENSING STUDIES OF MOUNT ETNA VOLCANO Progress Report**

R. Cassinis, Principal Investigator, G. M. Lechi, C. M. Marino, and A. M. Tonelli 26 Sep. 1974 9 p Sponsored by NASA EREP

(E74-10775; NASA-CR-140128; PR-3) Avail: NTIS  
 HC \$3.25 CSCL 08F

**N74-34750\*#** Earth Science Research Corp., Santa Monica, Calif.

**FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Aug. 1974**

Paul M. Merfield, Principal Investigator 5 Sep. 1974 2 p EREP

(Contract NAS2-7698)

(E74-10783; NASA-CR-140136; MPR-15) Avail: NTIS  
 HC \$3.25 CSCL 08E

**N74-34756\*#** Consiglio Nazionale delle Ricerche, Milan (Italy).  
 Lab. per la Geofisica della Litosfera.

**SKYLAB MULTISPECTRAL PHOTOGRAPHY OF ITALIAN VOLCANOLOGY, GEOLOGY, RICE FIELDS, AND PALEO RIVER BEDS Progress Report**

R. Cassinis, Principal Investigator, G. M. Lechi, C. M. Marino, and A. M. Tonelli 9 May 1974 3 p Sponsored by NASA EREP

**N74-34758\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**APPLICATION OF ERTS AND EREP IMAGES TO GEOLOGIC INVESTIGATIONS OF THE BASIN AND RANGE: COLORADO PLATEAU BOUNDARY IN NORTHWESTERN AND NORTH-CENTRAL ARIZONA Progress Report, 15 Aug. 1973 - 15 Sep. 1974**

A. F. H. Goetz, Principal Investigator, F. C. Billingsley, D. P. Elston (US Geological Survey, Flagstaff, Ariz.), I. Lucchita (US Geological Survey, Flagstaff, Ariz.), and E. M. Shoemaker (California Inst. of Technology, Pasadena) 15 Sep. 1974 10 p Sponsored by NASA ERTS

(E74-10791; NASA-CR-140144) Avail: NTIS HC \$4.00 CSCL 08G

The author has identified the following significant results. In the course of the ERTS investigation in the Cataract Creek Basin of the Coconino Plateau it was recognized that shallow perched ground water associated with the Kaibab Limestone could be discovered by means of drilling guided by geologic mapping aided by the use of ERTS imagery. At the Globe Ranch, the perched water table is only 5 meters beneath the surface at the site of the original, hand dug well. Recharge occurs from local runoff and from direct precipitation on the outcrop belt of the sandstone. This well provides water for the ranch at the rate of about 1,000 gallons a week. In order to explore the possibility of further developing this aquifer, unit 5 was mapped over an area of about 50 square miles in the vicinity of the hand-dug well, with negative results. A new location was then picked for drilling based on the occurrence of unit 5 in a favorable structural setting. This location was along a normal fault, and it was anticipated that water might be structurally trapped within the down-dropped block of the fault. Four shallow testholes were drilled and all encountered water. These four water-bearing holes are currently being monitored and will be tested to determine potential production of water from the local sandstone aquifer.

**N74-34760\*#** Colorado School of Mines, Golden. Dept. of Geology.

**GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report**

Keenan Lee, Principal Investigator 27 Sep. 1974 6 p EREP (Contract NAS9-13394)

(E74-10793; NASA-CR-140146) Avail: NTIS HC \$3.25 CSCL 08G

**N74-34770#** California Earth Science Corp., Santa Monica.  
**APPLICATION OF ERTS IMAGES TO STUDY OF ACTIVE AND POTENTIALLY ACTIVE FAULTS, SANTA BARBARA AREA, CALIFORNIA**

D. L. Lamar and P. M. Merfield Sep. 1974 37 p refs  
 (Contract USGS-14-08-0001-13911)

(TR-74-3) Avail: NTIS HC \$5.00 CSCL 08E

The ERTS images were utilized in the preparation of the seismic safety element for Santa Barbara County. All significant active faults can be recognized in the ERTS images, and 70 per cent of their total lengths can be readily traced. Major faults are commonly more easily traced on ERTS images than on larger scale (1:130,000) photos. Arguments are presented for a possible 44-mile (76 km) western extension of the Big Pine fault, first recognized as a prominent lineament in ERTS images. Author

**N74-34780\* Geological Survey, Hawaii Volcanoes National Park.  
 RECENT LANDFORMS AT KILAUEU VOLCANO: A SELECTED PHOTOGRAPHIC COMPIATION**

Robin T. Holcomb, Donald W. Peterson, and Robert I. Tilling /in NASA. Ames Res. Center Guidebook to the Hawaiian Planetology Conf. Aug. 1974 p 49-86 refs

CSCL 08E

Recent eruptive activity at Kilauea has produced great changes in the landscape, modifying old landforms and creating new ones. Some of these landforms are observed fairly commonly in basaltic terrains, but many had rarely, if ever, been observed before in the process of development. The 1969-74 Mauna Ulu eruptions have provided the first historic opportunity at Kilauea to witness and record the development of features associated with flank activity of long duration. The photographs of new or modified landforms in this compilation place special emphasis on possible extraterrestrial analogs. Author

**N74-34781\* Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.**

## 04 GEOLOGY AND MINERAL RESOURCES

### GEOLOGY OF THE ISLAND OF HAWAII

Gordon A. Macdonald /in NASA. Ames Res. Center Guidebook to the Hawaiian Planetology Conf. Aug. 1974 p 88-111

CSCL 08G

The account of the geology of the individual Hawaiian islands is only a progress report based very largely on the uppermost, visible parts of the Hawaiian volcanic range. The island of Hawaii today consists of five volcanic mountains. All of them are very young, and three of the volcanoes have been active in historic times. At least two other volcanoes which helped to build the island have been buried by more recent ones. Rocks exposed in the cliffs on the northeastern side of Kohala Mountain have been shown by the potassium-argon method to be about 700,000 years old.

Author

**N74-34791#** Bureau of Mines, Morgantown, W.Va. Energy Research Center.

### RELATIONSHIPS OF EARTH FRACTURE SYSTEMS TO PRODUCTIVITY OF A GAS STORAGE RESERVOIR

W. K. Overbey, Jr., W. K. Sawyer, and B. R. Henniger (Ashland College, Ohio) 1974 142 p refs

(BM-R1-7952) Avail: NTIS HC \$10.25

The Bureau of Mines conducted surface joint and stress measurements, airborne remote sensing imagery studies, compass-oriented borehole televiewer surveys, numerical simulation of fractured wells, and well productivity studies in a four-quadrangle study area of Ohio, to determine the effects of earth fracture systems on the deliverability of gas storage fields. The results of these studies indicate that much useful information about a gas storage reservoir can be obtained and put to practical use by studying: (1) oriented cores for fractures and directional permeability, (2) orientation of induced hydraulic fractures for alignment of well patterns, and (3) aerial photos and multispectral scanner imagery for general surface geology comparison and to determine if some development patterns can be generated by such results. Studies should be conducted in gently folded and strongly folded sedimentary formation areas to determine if the increased knowledge of earth fracture systems under these conditions might be beneficial in gasfield and gas storage reservoir development.

Author

## OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

**A74-38546** Measurements of microwave forward scattering from the ocean at L-band. C. I. Beard, D. L. Drake, and C. M. Morrow (U.S. Navy, Naval Research Laboratory, Washington, D.C.). In: NAECON '74; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 13-15, 1974.

New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 269-274. 13 refs.

**A74-39278 #** Use of remote sensing in the study of Antarctic marine resources. S. Z. El-Sayed and K. A. Green (Texas A & M University, College Station, Tex.). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973.

Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 47-63. 22 refs. NSF Grant No. GV-36215X.

The krill is a valuable Antarctic marine resource which will some day be commercially exploited as a food source. The physical, chemical, and biological milieu of the Antarctic seas in which the krill is found is described generally in terms of pack ice distribution, light variations, cloud cover, physical oceanography, the distribution of nutrient salts, and phytoplankton and zooplankton population. The distribution of krill is discussed, and the extent, color, location and other features of krill swarms which may render them susceptible to remote sensing are indicated. Technique for the remote sensing of chlorophyll and sea temperature are available, but a technique for detecting krill swarms is not yet developed, though studies are in progress.

P.T.H.

**A74-39279 #** Remote sensing of Antarctic biological resources - Vertebrates. D. B. Siniiff and V. B. Kuechle (Minnesota, University, St. Paul, Minn.). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973.

Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 65-74. 11 refs.

The present work considers the application of aerial or satellite sensing in the assessment of the visible vertebrate populations of Antarctica (i.e., seals and penguins). The current hardware and resolutions which are required for identification of various animal concentrations are discussed. Guidelines concerning type of instrumentation are proposed, and the possibility of using floating platforms or remote land stations which can communicate to satellites passing overhead is discussed.

P.T.H.

**A74-39282 \* #** Dynamics and morphology of Beaufort Sea ice determined from satellites, aircraft, and drifting stations. W. J. Campbell (U.S. Geological Survey, Takoma, Wash.), P. Gloersen, W. Nordberg, and T. T. Wilheit (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973.

Berlin, East

Germany, Akademie-Verlag GmbH, 1974, p. 311-327. 19 refs. Contract No. NOAA-NA-916-73.

**A74-41016** Observations from Skylab of mesoscale turbulence in ocean currents. R. E. Stevenson (U.S. Navy, Scripps Institution of Oceanography, La Jolla, Calif.). *Nature*, vol. 250, Aug. 23, 1974, p. 638-640. 7 refs.

Evidence of mesoscale turbulence in warm-water currents flowing poleward from equatorial oceans was obtained by astronauts aboard Skylab. A study of photographs taken aboard Skylab 2 over the northwest Caribbean Sea shows that the vortices varied in diameter from 3 to 20 nautical miles. The associated atmospheric manifestations indicated cool surface water temperatures in the eddies and down-current boundaries with waters warmer than those of the open current. It was found that turbulent vortices were constantly embedded within the main stream of warm ocean currents.

G.R.

**A74-44606 #** On aerophotographic interpretation in the mapping of the deposition belt and of the submerged plant societies in waters of low depth of visibility. G. Wolff and A. Lindner (Rostock, Universität, Eberswalde, East Germany). *Jena Review*, vol. 19, no. 3, 1974, p. 182-186. 5 refs.

**A74-44646 #** Use of artificial earth satellites to measure the swell of the sea (Ispol'zovanie iskusstvennykh sputnikov zemli dlia izmereniia volneniia). A. A. Zagorodnikov. *Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol. 10, July 1974, p. 791-798. 20 refs. In Russian.

**A74-45067** Measurement of water vapor content over the oceans by SHF radiometers aboard Cosmos-243. L. M. Mitnik. In: Advances in satellite meteorology. 2. New York, Halsted Press; Jerusalem, Israel Program for Scientific Translations, 1974, p. 65-73. 14 refs. Translation.

Maps are given of atmospheric water vapor content over the tropical and subtropical latitudes of the Pacific, Atlantic, and Indian oceans, constructed on the basis of the earth's thermal emission measured aboard Cosmos-243. Isolines of water vapor content are drawn at 0.5 g/sq cm intervals. The main features of the moisture field are discussed (time variations in water vapor content during various synoptic situations, comparison with water vapor values derived from radiosonde data). The maps of water vapor content show that the distribution indicates stable seasonal features of the atmospheric circulation. The continents strongly affect the atmospheric distribution of water vapor. For example, in the Southern Hemisphere the boundary between dry and moist air is displaced markedly northward with decreasing distance to Australia and, particularly, South America.

(Author)

**A74-45074** Weather satellites as a means of ice observations. A. V. Bushuev and N. A. Volkov. In: Advances in satellite meteorology. 2. New York, Halsted Press; Jerusalem, Israel Program for Scientific Translations, 1974, p. 140-147. Translation.

## 05 OCEANOGRAPHY AND MARINE RESOURCES

It is shown that TV photographs made in the absence of clouds can provide much information on the dynamic processes occurring in ice covers. In addition, satellite data can be used to supplement ice maps with information on areas not covered by two parallel aerial ice surveys, to compile ice maps for periods between two successive aerial ice surveys, and for mapping ice distributions in areas where ice surveys are infrequently performed. V.P.

**A74-45298 \*** Ocean color spectrum calculations. W. R. McCluney (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Applied Optics*, vol. 13, Oct. 1974, p. 2422-2429, 23 refs.

There is obvious value in developing the means for measuring a number of subsurface oceanographic parameters using remotely sensed ocean color data. The first step in this effort should be the development of adequate theoretical models relating the desired oceanographic parameters to the upwelling radiances to be observed. A portion of a contributory theoretical model can be described by a modified single scattering approach based on a simple treatment of multiple scattering. The resulting quasisingle scattering model can be used to predict the upwelling distribution of spectral radiance emerging from the sea. The shape of the radiance spectrum predicted by this model for clear ocean water shows encouraging agreement with measurements made at the edge of the Sargasso Sea off Cape Hatteras. (Author)

**A74-45949 #** Upper tropospheric isobaric temperature and height fields over the tropical Atlantic from satellite infrared spectrometer soundings. D. N. Sikdar and R. S. Cram (Wisconsin, University, Madison, Wis.). *Meteorological Society of Japan, Journal*, vol. 52, Apr. 1974, p. 175-187. 7 refs. Contract No. NOAA-E-230-68(G).

**N74-29686\* #** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER** Monthly Progress Report, Jun. 1974 George A. Maul, Principal Investigator Jun. 1974 2 p EREP (NASA Order T-4713-B) (E74-10654; NASA-CR-138887; MPR-12) Avail: NTIS HC \$4.00 CSCL 08J

**N74-29738#** Coast Guard, Washington, D.C. **REPORT OF THE INTERNATIONAL ICE PATROL SERVICE IN THE NORTH ATLANTIC OCEAN: SEASON OF 1971** Oceanographic Report, 9 Mar. - 29 Jun. 1971 E. A. Delaney 30 Jan. 1974 51 p refs (AD-778013; USCG-Bull-57; USCG-188-26) Avail: NTIS CSCL 08/10

The report is the 57th in a series of annual reports on the International Ice Patrol Service in the North Atlantic Ocean. It contains information on Ice Patrol organization, communications and operations, and on ice and environmental conditions which existed during the 1971 International Ice Patrol year.

Author (GRA)

**N74-30663\* #** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab. **PRELIMINARY S-193 RADSCAT OCEANOGRAPHIC DATA FOR SKYLAB 2**

Willard J. Pierson, Jr., Richard K. Moore, Principal Investigators, Arun Sobti, and James Young Feb. 1974 31 p refs EREP

(Contract NAS9-13642)

(E74-10525; NASA-CR-138274; CRES-TM-254-3) Avail: NTIS HC \$4.75 CSCL 08C

**N74-30777\*** Geological Survey, Reston, Va. Branch of International Activities Topographic Div. **NEW SPACE TECHNOLOGY ADVANCES KNOWLEDGE OF THE REMOTE POLAR REGIONS**

William R. MacDonald In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1011-1022 ref

(Paper-W3) CSCL 08L

The application of ERTS-1 imagery is rapidly increasing man's knowledge of polar regions. Products compiled from this imagery at scales of 1:250,000, 1:500,000 and 1:1,000,000 are already providing valuable information to earth scientists working in Antarctica. Significant finds detected by these benchmark products were glaciological changes, advancement in ice fronts, discovery of new geographic features, and the repositioning of nunataks, islands, and ice tongues. Tests conducted in Antarctica have proven the feasibility of tracking Navy navigation satellites to establish ground control for positioning ERTS-1 imagery in remote areas. ERTS imagery coupled with satellite geodesy shows great promise and may prove to be the most practical and cost effective way to meet the small-scale cartographic requirements of the polar science community. Author

**N74-30792\*** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **RELATIONSHIPS BETWEEN ERTS RADIANCES AND GRADIENTS ACROSS OCEAN FRONTS**

George A. Maul and Howard R. Gordon (Miami Univ., Coral Gables) In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1279-1308 refs

(NASA Order S-70246-AG)

(Paper-M1) CSCL 08C

A time series of the Loop Current in the Gulf of Mexico, covering an annual cycle of growth, spreading, and decay, has been obtained in synchronization with ERTS. Computer enhanced images, which are necessary to extract useful oceanic information, show that the current can be observed either by color or sea state effects associated with the cyclonic boundary. The color effect relates to the spectral variations in the optical properties of the water and its suspended particles, and is studied by radiative transfer theory. Significant oceanic parameters identified are: the probability of forward scattering, and the ratio of scattering to total attenuation. Author

**N74-30793\*** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **OCEAN INTERNAL WAVES OFF THE NORTH AMERICAN AND AFRICAN COASTS FROM ERTS-1**

John R. Apel and Robert L. Charnell In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1309-1316

(Paper-M2) CSCL 08C

Periodic features observed in the ocean portions of certain ERTS-1 images have been identified with reasonable certainty as surface manifestations of oceanic internal gravity waves. A series of images taken over the New York Bight, commencing with the 16 July 1972 overpass and continuing on into autumn of 1973, has shown the internal waves to be present when summer solar heating stratifies the water sufficiently well to support such oscillations. When fall and winter wind action mixes the shelf water down to the bottom, the waves no longer appear. In the Bight, the wavelengths range from approximately 400 to 1000 m, with the wave field being most sharply delineated near the edges of the continental shelf, at the mouth of the

Hudson Canyon. They appear in packets consisting of several waves separated by 10-15 km, which propagate up on the shelf and disappear. Author

**N74-30794\*** National Marine Fisheries Service, Bay Saint Louis, Miss.

**A REVIEW OF INITIAL INVESTIGATIONS TO UTILIZE ERTS-1 DATA IN DETERMINING THE AVAILABILITY AND DISTRIBUTION OF LIVING MARINE RESOURCES**

William H. Stevenson, Andrew J. Kemmerer, Buddy H. Atwell (NASA, Mississippi Test Facility), and Paul M. Maughan (Earth Satellite Corp.) *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1317-1331 refs

(Paper-M3) CSCL 08A

This study was initiated in July 1972 to determine the reliability of satellite and high altitude sensors to provide data about oceanographic parameters in coastal waters; demonstrate the use of remotely sensed oceanographic information to predict the distribution and abundance of adult menhaden; and, demonstrate the potential of using satellite acquired information for improving the harvest and management of a fishery resource. The study focused on coastal areas as in the north central portion of the Gulf of Mexico including parts of Alabama, Mississippi and Louisiana. The area used in the final analysis was limited to the Mississippi Sound, which is approximately 145 kilometers (90 miles) long and 16 kilometers (10 miles) wide, has an average water depth of about 3.7 meters (12 feet), and in general characterizes an estuarine environment. Author

**N74-30801\*** Environmental Research and Technology, Inc., Lexington, Mass.

**MONITORING ARCTIC SEA ICE USING ERTS IMAGERY**  
James C. Barnes and Clinton J. Bowley *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1453-1465 refs

(Paper-M10) CSCL 08L

Because of the effect of sea ice on the heat balance of the Arctic and because of the expanding economic interest in arctic oil and other minerals, extensive monitoring and further study of sea ice is required. The application of ERTS data for mapping ice is evaluated for several arctic areas, including the Bering Sea, the eastern Beaufort Sea, parts of the Canadian Archipelago, and the Greenland Sea. Interpretive techniques are discussed, and the scales and types of ice features that can be detected are described. For the Bering Sea, a sample of ERTS imagery is compared with visual ice reports and aerial photography from the NASA CV-990 aircraft. Author

**N74-30802\*** RAND Corp., Santa Monica, Calif.

**APPLICABILITY OF ERTS TO ANTARCTIC ICEBERG RESOURCES**

John L. Hult and Neill C. Ostrander *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1467-1490 refs

(Paper-M11; R-1354-NASA/NSF) CSCL 08L

This investigation explores the applicability of ERTS to: (1) determine the Antarctic sea ice and environmental behavior that may influence the harvesting of icebergs, and (2) monitor iceberg locations, characteristics, and evolution. Imagery sampling in the western Antarctic between the Peninsula and the Ross Sea is used in the analysis. It is found that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the glowing promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global thirst for fresh water. Several years of comprehensive monitoring will be necessary to characterize sea-ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means for harmonizing entitlements to iceberg resources. Author

**N74-30809\*** Army Cold Regions Research and Engineering Lab., Hanover, N.H.

**APPLICATIONS OF ERTS-1 IMAGERY TO TERRESTRIAL AND MARINE ENVIRONMENTAL ANALYSES IN ALASKA**  
D. M. Anderson, H. L. McKim, W. K. Crowder, R. K. Haugen, L. W. Gatto, and T. L. Marlar *In* NASA, Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1575-1606 refs

(Paper-E7) CSCL 08F

ERTS-1 imagery provides a means of distinguishing and monitoring estuarine surface water circulation patterns and changes in the relative sediment load of discharging rivers on a regional basis. It also will aid local fishing industries by augmenting currently available hydrologic and navigation charts. The interpretation of geologic and vegetation features resulted in preparation of improved surficial geology, vegetation and permafrost terrain maps at a scale of 1:1 million utilizing ERTS-1 band 7 imagery. This information will be further utilized in a route and site selection study for the Nome to Kobuk Road in central Alaska. Large river icings along the proposed Alaska pipeline route have been monitored. Sea ice deformation and drift northeast of Point Barrow, Alaska has been measured and shorefast ice accumulation and ablation along the west coast of Alaska is being mapped for the spring and early summer seasons. These data will be used for route and site selection, regional environmental analysis, identification and inventory of natural resources, land use planning, and in land use regulation and management. Author

**N74-30836\*#** Research Triangle Inst., Research Triangle Park, N.C.

**ENGINEERING STUDIES RELATED TO GEODETIC AND OCEANOGRAPHIC REMOTE SENSING USING SHORT PULSED TECHNIQUES** Final Engineering Report for Task D

May 1973 44 p refs Prepared by North Carolina State Univ. (Contract NAS6-2135)

(NASA-CR-137464) Avail: NTIS HC \$5.25 CSCL 08C

Theoretical basis is presented for a feasibility study of measuring global ocean surface current pattern from satellites and aircraft. The analysis is supported by some preliminary laboratory experiments. Since the ultimate goal is to establish an operational routine for monitoring the global current pattern, a nondisturbing remote sensing device using a laser probe was developed. Detailed construction of the measuring system and the results of some preliminary observations are also presented. Author

**N74-30838\*#** California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.

**THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. 1: PIGMENTS**

R. Ikan, Z. Aizenshtat, M. J. Baedeker, and I. R. Kaplan [1974] 28 p refs

(Grant NGR-05-007-221)

(NASA-CR-139394; Publ-1243) Avail: NTIS HC \$4.50 CSCL 08J

Sediment from Tanner Basin, the outer continental shelf off Southern California, was analyzed for photosynthetic pigments and their derivatives, namely carotenes and chlorins. Samples of the sediment were also exposed to raised temperatures (65, 100, 150 C) for various periods of time (1 week, 1 month, 2 months). Analysis of the heat-treated sediment revealed the presence of alpha-ionene and 2,6-dimethylnaphthalene, thermal degradation products of Betacarotene. Chlorins were converted to nickel porphyrins of both DPEP and etio series. Possible mechanisms of these transformations are presented. Author

**N74-30839\*#** California Univ., Los Angeles. Dept. of Geophysics and Planetary Physics.

**THERMAL ALTERATION OF ORGANIC MATTER IN RECENT MARINE SEDIMENTS. 2: ISOPRENOIDS**

## 05 OCEANOGRAPHY AND MARINE RESOURCES

R. Ikan, M. J. Baedeker, and I. R. Kaplan [1974] 45 p refs (Grant NGR-05-007-221) (NASA-CR-139195; Publ-1244) Avail: NTIS HC \$5.25 CSCL 08J

A series of isoprenoid compounds were isolated from a heat treated marine sediment (from Tanner Basin) which were not present in the original sediment. Among the compounds identified were: phytol, dihydrophytol, c-18-isoprenoid ketone, phytanic and pristanic acids, c-19 and c-20-monoolefines, and the alkanes pristane and phytane. The significance and possible routes leading to these compounds is discussed. Author

**N74-30842\*#** Applied Science Associates, Inc., Apex, N.C. **OCEAN DYNAMICS STUDIES Final Report**

May 1974 185 p refs

(Contract NAS6-2307)

(NASA-CR-137467) Avail: NTIS HC \$12.25 CSCL 08C

Both the theoretical and experimental investigations into current-wave interactions are discussed. The following three problems were studied: (1) the dispersive relation of a random gravity-capillary wave field; (2) the changes of the statistical properties of surface waves under the influence of currents; and (3) the interaction of capillary-gravity with the nonuniform currents. Wave current interaction was measured and the feasibility of using such measurements for remote sensing of surface currents was considered. A laser probe was developed to measure the surface statistics, and the possibility of using current-wave interaction as a means of current measurement was demonstrated. Author

**N74-30876#** Defence Research Establishment Ottawa (Ontario). **WINTER ICE RECONNAISSANCE IN NARES STRAIT, 1972 - 1973**

Moir Dunbar Feb. 1974 28 p refs

(AD-779687; DREO-TN-73-26) Avail: NTIS CSCL 08/12

The report is the third in a series of reports describing winter ice conditions in Nares Strait. Three flights were made in 1972-73, using radar scope photography on the first and Sideways Looking Airborne Radar on the others. The ice consolidated even earlier than in the previous year, in response to another winter of comparatively calm winds. Author (GRA)

**N74-30883#** Woods Hole Oceanographic Institution, Mass. **SUSPENDED MATTER OTHER PROPERTIES OF SURFACE WATERS OF THE NORTHEASTERN ATLANTIC OCEAN**

K. O. Emery, Fred Lepple (Delaware Univ.), Lois Toner, Elazar Uchupi, R. H. Rioux, Walter Pople (Natal Univ.), and E. M. Hulburt Mar. 1974 61 p refs

(Grant NSF GX-28193)

(PB-229895/8; WHOI-74-17; WHOI-Contrib-3296) Avail: NTIS HC \$3.75 CSCL 08J

Samples of suspended matter were collected at 1534 stations off the west coast of Africa during two geophysical cruises of 1972 and 1973. Many correlations exist with respect to auxiliary measurements of winds, temperature, salinity, currents, chlorophyll, phytoplankton, zooplanktonnekton, dustfall, and proximity to major river mouths. Some of the relationships can be expressed in terms of oceanic zones. (Modified author abstract) GRA

**N74-30900\*#** Research Triangle Inst., Research Triangle Park, N.C.

**ANALYSIS OF SATELLITE ALTIMETER SIGNAL CHARACTERISTICS AND INVESTIGATION OF SEA-TRUTH DATA REQUIREMENTS Final Report**

Apr. 1972 159 p refs

(Contract NAS6-1952)

(NASA-CR-137465) Avail: NTIS HC \$11.00 CSCL 14B

Results are presented of analysis of satellite signal characteristics as influenced by ocean surface roughness and an investigation of sea truth data requirements. The first subject treated is that of postflight waveform reconstruction for the Skylab S-193 radar altimeter. Sea state estimation accuracies are derived based on analytical and hybrid computer simulation techniques. An analysis of near-normal incidence, microwave backscattering from the ocean's surface is accomplished in order to obtain the minimum sea truth data necessary for good agreement between theoretical and experimental scattering results. Sea state bias is examined from the point of view of designing an experiment which will lead to a resolution of the problem. A discussion is given of some deficiencies which were found in the theory underlying the Stilwell technique for spectral measurements. Author

**N74-30910#** Naval Weapons Lab., Dahlgren, Va. **CROSS TRACK VERTICAL DEFLECTION ACCURACY OF A DUAL SATELLITE ALTIMETRY SYSTEM**

Cary Chen Mar. 1974 21 p refs

(AD-779821; NWL-TR-3117) Avail: NTIS CSCL 08/3

Cross track vertical deflection uncertainty of sea surface from a dual satellite radar altimeter system is investigated in this study. The representative case simulated for study is 1000 km height satellites in nearly circular polar orbits. The along track separation of the two satellites is approximately 300 km which corresponds to a cross track radar coverage of 10 minutes of arc. Using gravity field perturbation alone, it is found 2 sec relative error of deflection of vertical as most optimistic while 4 sec represents a more realistic error. The 2 sec relative error of deflection of vertical agrees well with a similar simulation study done by the Applied Physics Laboratory, Johns Hopkins University. Author (GRA)

**N74-31106** Joint Publications Research Service, Arlington, Va. **DETERMINING THE INFORMATION RELATION BETWEEN THE PRESSURE FIELDS OF THE ATMOSPHERE AND THE ICE DRIFT IN THE ARCTIC SEAS (IN THE EXAMPLE OF THE LAPTEV SEA)**

A. I. Murzin *In its Meteorol. and Hydrol.*, No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 106-114 refs Transl. into ENGLISH from *Meteorol. i Gidrol.* (Moscow), no. 5, 1974 p 74-79

The possibility was studied of applying the entropic relation to determining the optimal scales of atmospheric processes which effect ice drift in the Laptev Sea. Author

**N74-31792\*#** Alaska Univ., Fairbanks. Inst. of Marine Science.

**SEA-SURFACE CIRCULATION, SEDIMENT TRANSPORT, AND MARINE MAMMAL DISTRIBUTION, ALASKA CONTINENTAL SHELF Final Report, Jul. 1972 - Jan. 1974**

F. F. Wright, Principal Investigator, G. D. Sharma, J. J. Burns, and D. C. Burbank 5 Feb. 1974 84 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21833)

(E74-10711; NASA-CR-139544) Avail: NTIS HC \$7.25 CSCL 08C

**N74-31807\*#** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Jul. 1974**

George A. Maul, Principal Investigator Jul. 1974 2 p EREP (NASA Order T-4713-B)

(E74-10728; NASA-CR-139574; MPR-13) Avail: NTIS HC \$4.00 CSCL 08C



**N74-31888#** Army Coastal Engineering Research Center, Washington, D.C.

**USE OF EARTH RESOURCES TECHNOLOGY SATELLITE (ERTS-1) IN COASTAL STUDIES**

Orville T. Magoon 1973 11 p refs Repr. from NASA/Goddard Space Flight Center ERTS-1 Symp., 29 Sep. 1973

(AD-766378; CERC-Reprint-5-73) Avail: NTIS CSCL 08/6

A few samples of the ERTS-1 imagery in coastal studies are presented. Even with the limited inspection possible of available imagery, a number of clearly demonstrated applications of ERTS to coastal studies is described. GRA

**N74-31906#** Coast Guard, Washington, D.C.

**REPORT OF THE INTERNATIONAL ICE PATROL SERVICE IN THE NORTH ATLANTIC OCEAN, SEASON OF 1972**

30 Jan. 1974 62 p refs

(AD-780537; USCG-Bull-58; USCG-188-27) Avail: NTIS CSCL 08/10

The report is 58th in a series of Annual Reports on the International Ice Patrol Service in the North Atlantic Ocean. It contains information on Ice Patrol organization, communications and operations, on ice and environmental conditions and their relationship in 1972, and on the dynamic topography surveys conducted during April, May and June 1972. GRA

**N74-32772\*#** Delaware Univ., Newark. College of Marine Studies.

**MONITORING THE DISPERSION OF OCEAN WASTE DISPOSAL PLUMES FROM ERTS-1 AND SKYLAB**

V. Klemas, Principal Investigator, G. Davis, and T. Myers 18 Sep. 1974 2 p ERTS

(Contracts NAS5-21837; NAS1-12304)

(E74-10746; NASA-CR-139986) Avail: NTIS HC \$4.00 CSCL 08C

The author has identified the following significant results. About forty miles off the Delaware coast is located the disposal site for waste discharged from a plant processing titanium dioxide. The discharge is a greenish-brown; 15-20% acid liquid which consists primarily of iron chlorides and sulfates. The barge which transports this waste has a 1,000,000 gallon capacity and makes approximately three trips to the disposal site per week. ERTS-1 MSS digital tapes are being used to study the dispersion patterns and drift velocities of the iron-acid plume. Careful examination of ERTS-1 imagery disclosed a fishhook-shaped plume about 40 miles east of Cape Henlopen caused by a barge disposing acid wastes. The plume shows up more strongly in the green band than in the red band. Since some acids have a strong green component during dumping and turn slowly more brownish-reddish with age, the ratio of radiance signatures between the green and red bands may give an indication of how long before the satellite overpass the acid was dumped. Enlarged enhancements of the acid waste plumes, prepared from the ERTS-1 MSS digital tapes aided considerably in studies of the dispersion of the waste plume. Currently acid dumps are being coordinated with ERTS-1 overpasses.

**N74-32773\*#** Delaware Univ., Newark. College of Marine Studies.

**TRACKING AIR-DROPPED DROGUES AND DYES FROM AIRCRAFT IN SUPPORT OF ERTS-1 CIRCULATION STUDIES**

V. Klemas, Principal Investigator, G. Davis, and H. Wang 16 Sep. 1974 2 p ERTS

(Contract NAS5-21837)

(E74-10747; NASA-CR-139987) Avail: NTIS HC \$4.00 CSCL 08C

The author has identified the following significant results. For two years ERTS-1 has been employed to investigate current circulation patterns in Delaware Bay under different tidal, flow, and wind conditions. Since sufficient numbers of current meters and boats are not available, air-droppable drogues and dye packs have been developed and tested. The drogues consist of a styrofoam float and a line to which is attached a stainless steel biplane. The length of the line determines at what depth currents will be monitored. The floats are color coded to distinguish their movement and mark the depth of the biplanes. Simultaneously floating and anchored dye packs of fluorescein dye have been deployed from aircraft. The movement of the dye and drogues is tracked by sequential aerial photography, using fixed markers on shore or on buoys as reference points to calibrate the scale and direction of drogue movement. The current data obtained by this technique is then used to annotate current circulation maps derived from ERTS-1 imagery.

**N74-32789\*#** Applied Science Associates, Inc., Apex, N.C. **ENGINEERING STUDIES RELATED TO THE SKYLAB PROGRAM. TASK H: MICROWAVE/OPTICAL/INFRARED IMAGE PROCESSING FOR OCEAN CURRENT RECOGNITION Final Report**

A. G. Smith Jul. 1974 49 p refs

(Contract NAS6-2307)

(NASA-CR-137468) Avail: NTIS HC \$5.50 CSCL 08C

Images from the Skylab S-193 radar altimeter were selected from data obtained on appropriate passes made by Skylabs 2, 3, and 4 missions for the following three objectives: (1) to serve as a precursor to an investigation for the planned GEOS-C mission, in which radar altimeter data will be analyzed to reveal ocean current related to surface topography; (2) to determine the value of satellite infrared and visual radiometer data as potential sources of ground truth data, the results of which be incorporated in the planning of the SEASAT program; and (3) to determine whether optimal data reduction techniques are useful for revealing clues on Gulf Stream topographic signature characteristics. The results obtained which apply to the stated objectives are discussed. Author

**N74-32823** Deutsches Hydrographisches Institut, Hamburg (West Germany).

**OCEANOGRAPHY, FISHERY**

K. Struëbing /In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 18 p refs

The use of remote sensors for determining oceanographic parameters is discussed, including coastal zone processes, water pollution, organic matter, ocean color, sea surface temperature, sea surface salinity, sea state, sea surface altimetry, tides, sea ice, and icebergs. The topic of remote sensors in fisheries research involves direct methods, such as visual range cameras and infrared imagery, and indirect methods such as oil slicks, chlorophyll, and image intensifiers. Environmental effects on fish and man are dealt with. ESRO

**N74-32824** Ludwig-Maximilians-Universität, Munich (West Germany). Inst. fuer Meteorologie.

**OCEAN POLLUTION AND THE OCEAN-ATMOSPHERE SYSTEM**

H.-J. Bolle /In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 22 p refs

The influence of atmospheric constituents on the remote sensing of the ocean surface is discussed. Irradiance at the sea surface is dealt with and reflection at the sea surface is treated mathematically. The penetration of light into the ocean is detailed and the upwelling flux in the ocean is discussed. Modulation of the return signal by the atmosphere is discussed and special topics such as detection of oil slicks and phytoplankton recognition are elaborated. ESRO

## 05. OCEANOGRAPHY AND MARINE RESOURCES

**N74-32840** Israel Program for Scientific Translations, Ltd., Jerusalem.

### **EFFECT OF THE ATMOSPHERE ON THE ACCURACY OF MEASURING SEA SURFACE TEMPERATURE BY AIRCRAFT-BORNE RADIOMETERS**

I. T. Razumovskii *In its Atmospheric Radiation Studies* (TT-74-50010) 1974 p 66-69 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

The accuracy in measuring sea surface temperature by an aircraft borne radiometer is limited by the effect of the atmosphere intervening between the instrument and sea. Measurements of the temperature of the same sea surface area from different altitudes and in different spectral sections of the 7.15 to 14 micron transparent window show that the effect of the atmosphere decreases with reduction in filter passband. For a 300-m flight altitude the errors in temperature measurements in the 8 to 13.5 micron spectral region do not exceed 0.5 C. While measuring the temperature of the surface of the Gulf of Finland in May from altitudes up to 2,000 m in the 10.5 to 11.5 micron spectral region, the errors did not exceed 0.3 C; similar simultaneous measurements in the 9 to 12 micron transparent window resulted in an error of up to 0.5 C. The use of the 10.5 micron spectral section in measuring the sea surface temperature results in reducing the effect of the atmosphere and lowering the reflected radiation incident on the instrument. Author

**N74-33831\*** Science Applications, Inc., Ann Arbor, Mich.

### **USE OF SKYLAB EREP DATA IN A SEA SURFACE TEMPERATURE EXPERIMENT Quarterly Report**

David C. Anding, Principal Investigator and John P. Walker Sep. 1974: 9 p EREP (Contract NAS9-13277) (E74-10764: NASA-CR-140004; JRB-74-202-AA) Avail: NTIS HC \$4.00 CSCL 08J

**N74-33839#** Joint Publications Research Service, Arlington, Va.

### **USE OF ARTIFICIAL EARTH SATELLITES FOR MEASURING WAVES**

A. A. Zagorodnikov 16 Sep. 1974 17 p refs Transl. into ENGLISH from Izv. Akad. SSSR, Fiz. Atmosfery i Okeana (Moscow), v. 10, no. 7, 1974 p 791-798 (JPRS-62980) Avail: NTIS HC \$4.00

A proposal is presented for the use of radio-thermal emission from the sea to measure sea waves. Author

**N74-33840\*** Virginia Univ., Charlottesville.

### **ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT Final Report**

H. G. Goodell, C. M. Woolheater, and K. L. Echternacht Sep. 1972 139 p refs (Contracts NASA Order W-13165; DI-14-08-001-12540) (NASA-CR-139994; PB-214547; USGS-IR-NASA-243; USGS-DO-73-005) Avail: NTIS HC \$10.00 CSCL 08A

The Richmond-Cape Henry Environmental Laboratory (RICHEL) in southeastern Virginia is composed of 17 counties, 14 independent cities, and 21 incorporated towns arranged into 4 planning districts, and is the site chosen for an environmental model for the testing of coastal zone land use and marine resource management. The conceptual base and the geographic parameters used to describe the model are reviewed, and the environmental impacts of land use are assessed, including RICHEL population densities and trends, hydrology and erosion, power consumption, and water effluents from industrial, municipal, and agricultural sources. An environmental computer model is proposed for

RICHEL which was developed around the hydrologic cycle and includes 2 major data banks consisting of climate and land use. The computer model quantifies the impacts of population on the RICHEL environment in terms of human activities which result in interference with the hydrologic cycle, accelerated erosion, and effluent generation. A.A.D.

**N74-33841\*** Virginia Univ., Charlottesville.

### **ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT, APPENDICES A TO E**

Sep. 1972 202 p refs (NASA Order W-13165; Contract USGS-14-08-001-12540) (NASA-CR-140392; USGS-IR-NASA-243-App-A-B-C-D-E) Avail: NTIS HC \$13.25 CSCL 08A

Important data were compiled for use with the Richmond-Cape Henry Environmental Laboratory (RICHEL) remote sensing project in coastal zone land use and marine resources management, and include RICHEL climatological data and sources, a land use inventory, topographic and soil maps, and gaging records for RICHEL surface waters. A.A.D.

**N74-33842\*** Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

### **ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT, APPENDIX F: USER'S GUIDE FOR ADVECTION, CONVECTION PROTOTYPE**

Sep. 1972 140 p (NASA Order W-13165; Contract USGS-14-08-001-12540) (NASA-CR-140037; USGS-IR-NASA-243-App-F) Avail: NTIS HC \$10.00 CSCL 08A

A user's manual is provided for the environmental computer model proposed for the Richmond-Cape Henry Environmental Laboratory (RICHEL) application project for coastal zone land use investigations and marine resources management. The model was developed around the hydrologic cycle and includes two data bases consisting of climate and land use variables. The main program is described, along with control parameters to be set and pertinent subroutines. A.A.D.

**N74-33843\*** Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

### **ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE MANAGEMENT, APPENDICES G TO J**

Sep. 1972 140 p (NASA Order W-13165; Contract USGS-14-08-001-12540) (NASA-CR-140036; USGS-IR-NASA-243-App-G-H-I-J) Avail: NTIS HC \$10.00 CSCL 08A

Important data were compiled for use with the Richmond-Cape Henry Environmental Laboratory (RICHEL) remote sensing project in coastal zone land use and marine resources management, and include analyses and projections of population characteristics, formulation of soil loss prediction techniques, and sources and quantity analyses of air and water effluents. A.A.D.

**N74-33878\*** National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.

### **MARINE RESOURCES**

E. Lee Tilton, III *In its 3rd ERTS Symp., Vol. 3* May 1974 p 83-106 refs CSCL 08C

Techniques have been developed for defining coastal circulation patterns using sediment as a natural tracer, allowing the formulation of new circulation concepts in some geographical areas and, in general, a better capability for defining the seasonal characteristics of coastal circulation. An analytical technique for measurement of absolute water depth based upon the ratios of

two MSS channels has been developed. Suspended sediment has found wide use as a tracer, but a few investigators have reported limited success in measuring the type and amount of sediment quantitatively from ERTS-1 digital data. Significant progress has been made in developing techniques for using ERTS-1 data to locate, identify, and monitor sea and lake ice. Ice features greater than 70 meters in width can be detected, and both arctic and antarctic icebergs have been identified. In the application area of living marine resources, the use of ERTS-1 image-density patterns as a potential indicator of fish school location has been demonstrated for one coastal commercial resource, menhaden. ERTS-1 data have been used to locate ocean current boundaries using ERTS-1 image-density enhancement, and some techniques are under development for measurement of suspended particle concentration and chlorophyll concentration. The inter-relationship of water color and surface characteristics (sea state) are also being studied to improve spectral and spatial interpretive techniques. Author

**N74-34740\*** National Oceanic and Atmospheric Administration, Miami, Fla.  
**REMOTE SENSING OF PACIFIC HURRICANE AND RADIOMETRIC MEASUREMENTS FROM FOAM AND SLICKS** Progress Report  
 Duncan Ross, Principal Investigator, B. Au, W. Brown, J. McFadden, J. Kenney, and L. Martin 31 Jul. 1974 31 p refs  
 EREP  
 (NASA Order T-4644-B)  
 (E74-10773; NASA-CR-140126) Avail: NTIS HC \$3.75 CSCL 04B

**N74-34772\*** Virginia Inst. of Marine Science, Gloucester Point.  
**APPLICATION OF REMOTE SENSING TO STUDY NEAR-SHORE CIRCULATION** Annual Report for Year 2  
 John Zeigler, Robert Lobecker, Donald Stauble, Christopher Welch, Larry Haas, and C. S. Fang Sep. 1974 96 p refs  
 (Grant NGL-47-022-005)  
 (NASA-CR-140189) Avail: NTIS HC \$8.00 CSCL 80C

The research to use remote sensing techniques for studying the continental shelf is reported. The studies reported include: (1) nearshore circulation in the vicinity of a natural tidal inlet; (2) identification of indicators of biological activity; (3) remote navigation system for tracking free drifting buoys; (4) experimental design of an estuarine tidal circulation; and (5) Skylab support work. F.O.S.

**N74-34815\*** Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.  
**EXPERIMENTS ON REMOTE SENSING OF SEA ICE USING A MICROWAVE RADIOMETER**  
 Martti Tiuri 1974 12 p refs  
 (S-67; ISBN-951-750-329-6) Avail: NTIS HC \$4.00

Investigations were carried out in Finland to determine whether microwave radiometers are useful for surveying sea ice for the purpose of guiding ice breakers in the Baltic Sea. The frequency of the radiometer was set at 4.7 GHz. The three-channel radiometer used a novel traveling wave antenna with a beam direction dependent on the frequency, and was carried by a helicopter to measure the brightness temperatures of three adjacent ice strips. An auxiliary radiometer was used at 605 MHz for checking purposes. The results of measurements made during the winter of 1974 are discussed. Author

**N74-34831\*** Kansas Univ. Center for Research, Inc., Lawrence.  
**SCATTEROMETRY TECHNIQUES FOR SENSING ARCTIC SEA ICE THICKNESS** Final Report

Albert W. Biggs, D. L. Fayman, R. Matreci, R. K. Moore, and S. K. Parashar Nov. 1973 348 p refs  
 (Contract N60921-70-C-0221)  
 (AD-782611; CRES-TR-185-12; CRES-TR-185-13) Avail: NTIS CSCL 08/12

Investigation of radar discrimination of sea ice is presented. Radar scatterometer data at 75 and 2.25 cm wavelength obtained from NASA Earth Resources Aircraft Program Mission 126 were analyzed. The mission was conducted in April, 1970, off the coast of Point Barrow, Alaska. The scatterometer data were separated into seven different categories of sea ice. Sea ice was categorized according to thickness and age. The radar scattering from sea ice is compared for different sea ice types. An analytical theory of scatter from sea ice was developed and is presented. (Modified author abstract) GRA

**N74-34844\*** Scripps Institution of Oceanography, La Jolla, Calif. Advanced Ocean Engineering Lab.

**ADVANCED MARINE TECHNOLOGY: ELECTRO-MAGNETIC ROUGHNESS OF THE OCEAN SURFACE, 2-30 MHz** Final Report, 15 Dec. 1970 - 31 Oct. 1973  
 Robert H. Stewart 1 May 1974 107 p refs  
 (Contract N00014-69-A-0200-6012; NR Proj. 294-016)  
 (AD-783189; AOEL-61; SIO-Ref-74-13) Avail: NTIS- CSCL 08/3

The report is on a three-year project entitled Electromagnetic Roughness of the Ocean Surface, 2-30 MHz. The work was concerned with using HF radio waves scattered from the sea surface primarily as a tool to measure the directional distribution of ocean wave energy. Other areas investigated were the breakdown of linear scattering theory at the high end of the HF radio band, and the use of scatter as a method to measure ocean currents remotely. (Modified author abstract) GRA

**N74-34845\*** Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.

**OCEAN COLOR ANALYSIS** Final Technical Report  
 Siebert G. Duntley, Roswell W. Austin, Wayne H. Wilson, Catherine F. Edgerton, and Steven E. Moran. Apr. 1974 72 p refs  
 (Contract N00014-69-A-0200-6033; Grant NOAA-04-3-158-64)  
 (AD-783101; SIO-Ref-74-10) Avail: NTIS CSCL 08/10

The apparent spectral signal available to a remote sensor flying over ocean waters is studied. Report considers the effect of solar zenith angle, atmospheric conditions, windspeed, spectral region, and direction of view on the sensitivity to small changes in chlorophyll concentration. A method of synthesizing the inherent spectral radiance signature of the ocean surface is developed and new measurements of the downwelling spectral irradiance at the ocean surface and the radiance of the zenith sky are presented. Also studied are reflectance characteristics of the ocean surface when wind-generated whitecaps, foam, and spray are present. GRA

**N74-34849\*** Lamont-Doherty Geological Observatory, Palisades, N.Y.

**UNDERWAY MARINE GEOPHYSICAL DATA IN THE NORTH ATLANTIC, JUNE 1961 - JANUARY 1971. PART B: NAVIGATION CHARTS**  
 Apr. 1974 74 p  
 (Contract N00014-67-A-0108-0004; Grant NSF GA-27281; NR Proj. 083-142)  
 (AD-782522; TR-9-Pt-B; TR-3-Pt-B) Avail: NTIS CSCL 08/7

Track charts for Lamont-Doherty Geological Observatory underway magnetic, gravity and depth data in the North Atlantic June 1961 - January 1971 are given, including the Norwegian Sea, Gulf of Mexico, Caribbean and Mediterranean Sea.

Author (GRA)

## 05 OCEANOGRAPHY AND MARINE RESOURCES

**N74-34854#** Environmental Research Inst. of Michigan, Ann Arbor.

**BASIC INVESTIGATIONS FOR REMOTE SENSING OF COASTAL AREAS** Quarterly Report, 15 Apr. - 15 Jul. 1974

Robert K. Vincent 26 Jul. 1974 6 p

(Contract N00014-74-C-2073; NR Proj. 389-166)

(AD-783710; ERIM-108900-1-L) Avail: NTIS CSCL 08/6

The purpose of this contract is to investigate remote sensing methods for monitoring coastal areas. The effort is divided into three tasks, involving research on: Compositional mapping of beaches and river systems; multispectral radar imaging for coastal mapping; and enhancement of ocean bottom features with passive multispectral scanners. During the first quarter, significant progress was made on tasks 1 and 3, but work on task 2 has just begun, with nothing reportable as yet. GRA

## 06

# HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

**A74-42814** The application of aerial photography to surveys of derelict land in the United Kingdom. P. W. Bush (North Staffordshire Polytechnic, Stoke-on-Trent, Staffs., England) and W. G. Collins (Aston, University, Birmingham, England). In: Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972.

London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 167-181. 17 refs.

**A74-42818** The measurement of areal rainfall by the use of radar. W. A. Grinstead (Plessey Radar, Ltd., Weybridge, Surrey, England). In: Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 267-283. 7 refs.

**A74-42819** Some present uses of remote sensing in monitoring hydrological variables. R. B. Painter (Natural Environment Research Council, Institute of Hydrology, Wallingford, Berks., England). In: Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972. London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 285-298. 6 refs.

The high degree of temporal and spatial variation exhibited by most hydrological variables is discussed in relation to the use of remote sensing techniques, and levels of precision and frequency of measurement required from remote sensing are suggested. Satellite observations are considered to be potentially the most valuable, but even where the relation between the earth's emittance or reflectance and a particular variable is understood, many sensors at present give useful results only from platforms nearer the ground. Some present uses of remote sensing at the Institute of Hydrology are described. These deal with surface temperature of forest, snow depth and surveillance of surface flow channels. In summarizing the potential of remote sensing, the need for a considerable quantity of high-quality ground truth information is stressed. (Author)

**A74-43633** Solid earth and ocean tides estimated from satellite orbit analyses. K. Lambeck (Paris VI, Université, Paris; Centre National d'Etudes Spatiales, Groupe de Recherches de Géodésie Spatiale, Brétigny-sur-Orge, Essonne, France), A. Cazenave, and G. Balmino (Centre National d'Etudes Spatiales, Groupe de Recherches de Géodésie Spatiale, Brétigny-sur-Orge, Essonne, France). *Reviews of Geophysics and Space Physics*, vol. 12, Aug. 1974, p. 421-434. 58 refs.

The earth's tidal deformations cause perturbations in the motions of close earth satellites, observations of which give estimates of the Love number and phase lag. The contribution of the ocean tides has generally been considered unimportant, but this is not so. It is possible to extract some information on the ocean tides from the orbital analyses, and this could be used as a constraint in numerical ocean tide computations. An analysis is made of the orbit of the

satellite Geos 2 for the principal lunar tide. After correcting for the ocean tides, the value found for the Love number varies between 0.27 and 0.30, depending on which ocean tide model is used. The solutions for the phase angles are quite unsatisfactory, and this condition stems from insufficiently precise tracking data and inadequate coverage as well as from inadequate tide models. Approximate ocean tide corrections to the tide parameters determined by several authors are applied to give a mean value of 0.31 for the Love number and 0.5 deg for the phase lag. This phase lag corresponds to a mantle Q of about 60. (Author)

**A74-45389 \* #** Remote profiling of lake ice thickness using a short pulse radar system aboard a C-47 aircraft. D. W. Cooper, J. E. Heighway, D. F. Shook, R. J. Jirberg (NASA, Lewis Research Center, Cleveland, Ohio), and R. S. Vickers (Stanford Research Institute, Menlo Park, Calif.). *Earth Environment and Resources Conference, Philadelphia, Pa., Sept. 10-12, 1974, Paper. 4 p.*

Description of the design and operation of two new short-pulse radar systems developed for use aboard aircraft for remote profiling of lake ice thickness. The principle of operation is based on the fact that the return signal is composed of a pulse return from the top of the ice and another, delayed in time, from the ice-water interface. The delay time between these two pulses directly gives the ice thickness when allowance is made for the slower RF propagation through the ice. The two systems are the S band and the C band systems, and their comparative merits are discussed. M.V.E.

**N74-29683\* #** Institut Francais du Petrole, Rueil-Malmaison. **DYNAMIC BEHAVIOUR OF COASTAL SEDIMENTATION IN THE LIONS GULF** Final Report. Dec. 1972 - Mar. 1974. Max Guy, Principal Investigator Apr. 1974 49 p refs Sponsored by NASA. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (E74-10576; NASA-CR-138870) Avail: NTIS HC \$5.50 CSCL 08C

The author has identified the following significant results. A number of ERTS-1 images covering this geographical zone were studied and compared with cartographic maps, air photographs, and thermal-IR images. Old and recent sediments leave traces in the landscape which are decoded by interpreting the shapes of the clear zones forming a network against the black background representing water and humid zones. Current sedimentation and its mechanism were investigated. It had been hoped that a regular sequence of images would make it possible to follow the dynamics of the Rhone and the coastal rivers in relation to meteorological conditions. In any event only a small number of images spread over a wide period of time were obtained, and a complete study was therefore impossible. However, in comparing some of the ERTS-1 images certain thermal-IR images and information on the flow of the Rhone provided some clarification of mechanisms associated with river dynamics.

**N74-29687\* #** Delaware Univ., Newark. Coll. of Marine Studies.

**A NEW DEVICE FOR ACQUIRING GROUND TRUTH ON THE ABSORPTION OF LIGHT BY TURBID WATERS** Report on Significant Results. V. Klemas, Principal Investigator, R. Srna, and W. Treasure 26 Jul. 1974 2 p ERTS (Contract NAS5-21837) (E74-10655; NASA-CR-138886) Avail: NTIS HC \$4.00 CSCL 08H

The author has identified the following significant results. A new device, called a Spectral Attenuation Board, has been designed and tested, which enables ERTS-1 sea truth collection teams to monitor the attenuation depths of three colors continuously, as the board is being towed behind a boat. The device consists of a 1.2 x 1.2 meter flat board held below the

## 06 HYDROLOGY AND WATER MANAGEMENT

surface of the water at a fixed angle to the surface of the water. A camera mounted above the water takes photographs of the board. The resulting film image is analyzed by a microdensitometer trace along the descending portion of the board. This yields information on the rate of attenuation of light penetrating the water column and the Secchi depth. Red and green stripes were painted on the white board to approximate band 4 and band 5 of the ERTS MSS so that information on the rate of light absorption by the water column of light in these regions of the visible spectrum could be concurrently measured. It was found that information from a red, green, and white stripe may serve to fingerprint the composition of the water mass. A number of these devices, when automated, could also be distributed over a large region to provide a cheap method of obtaining valuable satellite ground truth data at present time intervals.

**N74-29694\*#** Maine Dept. of Transportation, Augusta. Bureau of Highways.

### **DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Final Report, May 1972 - Mar. 1974**

Ernest G. Stoeckler, Principal Investigator, Robert S. Farrell, and Raymond G. Woodman 15 Mar. 1974 61 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21772)

(E74-10663; NASA-CR-139037) Avail: NTIS HC \$6.25 CSDL 138

The author has identified the following significant results. Based on the detail study of the Sunkhaze Stream Watershed, it is believed that good detailed drainage studies can be derived from repetitive ERTS imagery. Land use maps tailored to hydrologic study can be prepared from ERTS imagery. Significant changes in the Sunkhaze Stream and Otter Stream Watersheds at spring flood conditions have given important information on the causes for flooding in the town of Bradley.

**N74-29696\*#** Maine Dept. of Transportation, Augusta. Bureau of Highways.

### **MAP THE DISTRIBUTION OF GLACIOFLUVIAL DEPOSITS AND ASSOCIATED GLACIAL LANDFORMS Final Report, May 1972 - Nov. 1973**

Raymond G. Woodman, Principal Investigator and Ernest G. Stoeckler 28 Nov. 1973 42 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contracts NAS5-21747; NAS5-21772; NAS5-21724)

(E74-10665; NASA-CR-139040) Avail: NTIS HC \$5.25 CSDL 088

**N74-29724\*#** Delaware Univ., Newark.

### **DYNAMICS OF PLANKTON POPULATIONS IN UPWELLING AREAS Final Report**

Karl-Heinz Szekielda [1974] 45 p refs

(Contract NAS5-21784)

(NASA-CR-139042) Avail: NTIS HC \$5.25 CSDL 08A

Recent investigations of the upwelling area along the NW Coast of Africa which include studies with satellites are discussed. The detection of patchiness in temperature and plankton distribution in the upwelling area is of special interest because they can be investigated from space synoptically with repeated coverage. The recent satellite missions provide recordings in the infrared region of the electromagnetic spectrum (EMR) as well as in the visible part. The information from those two parts of the EMR is useful for establishing the sea surface temperature and plankton distribution in upwelling areas. The temperature

distribution as observed with infrared sensors and the patchiness in plankton patterns are discussed as observed with the most recent satellites, namely the Earth Resources Technology Satellite (ERTS) and NOAA-2. Author

**N74-30670\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

### **[BLACK AND WHITE INFRARED IMAGERY AROUND LAKE MONROE, INDIANA] Monthly Report, Jul. 1974**

LeRoy Silva, Principal Investigator Jul. 1974 2 p EREP

(Contract NAS9-13301)

(E74-10678; NASA-CR-139274) Avail: NTIS HC \$4.00 CSDL 14E

**N74-30722\*** Centre for Overseas Pest Research, London (England).

### **ERTS SURVEYS A 500 km SQUARED LOCUST BREEDING SITE IN SAUDI ARABIA**

D. E. Pedgley /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 233-246

(Paper-A15) CSDL 06C

From September 1972 to January 1973, ERTS-1 precisely located a 500 sq km area on the Red Sea coastal plain of Saudi Arabia within which the Desert Locust (*Schistocerca gregaria*, Forsk.) bred successfully and produced many small swarms. Growth of vegetation shown by satellite imagery was confirmed from ground surveys and raingauge data. The experiment demonstrates the feasibility of detecting potential locust breeding sites by satellite, and shows that an operational satellite would be a powerful tool for routine survey of the 3 x 10 to the 7th power sq km invasion area of the Desert Locust in Africa and Asia, as well as of other locust species in the arid and semi-arid tropics. Author

**N74-30740\*** New Jersey Dept. of Environmental Protection, Trenton.

### **IMPACT OF ERTS-1 IMAGES ON MANAGEMENT OF NEW JERSEY'S COASTAL ZONE**

Edward B. Feinberg, Roland S. Yunghans, JoAnn Stitt, and Robert L. Mairs (Earth Satellite Corp., Washington, D. C.) /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 497-503

(Paper-L12) CSDL 08B

The thrust of New Jersey's ERTS investigation is development of procedures for operational use of ERTS-1 data by the Department of Environmental Protection in the management of the State's coastal zone. Four major areas of concern were investigated: detection of land use changes in the coastal zone; monitoring of offshore waste disposal; siting of ocean outfalls; and allocation of funds for shore protection. ERTS imagery was not useful for shore protection purposes; it was of limited practical value in the evaluation of offshore waste disposal and ocean outfall siting. However, ERTS imagery shows great promise for operational detection of land use changes in the coastal zone. Some constraints for practical change detection have been identified. Author

**N74-30775\*** Environmental Research and Technology, Inc., Lexington, Mass.

### **MAPPING SNOW EXTENT IN THE SALT-VERDE WATERSHED AND THE SOUTHERN SIERRA NEVADA USING ERTS IMAGERY**

James C. Barnes, Clinton J. Bowley, and David A. Simmes /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 977-993 refs

(Paper-W1) CSDL 08L

In much of the western United States a large part of the utilized water comes from accumulated mountain snowpacks; thus, accurate measurements of snow distributions are required for input to streamflow prediction models. The application of ERTS imagery for mapping snow has been evaluated for two geographic areas, the Salt-Verde Watershed in central Arizona and the southern Sierra Nevada in California. Techniques have been developed to identify snow and to differentiate between snow and cloud. The snow extent for these two drainage areas has been mapped from the MSS-5 (0.6-0.7 micron) imagery and compared with aerial survey snow charts, aircraft photography, and ground-based snow measurements. Author

**N74-30776\*** National Environmental Satellite Service, Washington, D.C.

## **SNOW-EXTENT MAPPING AND LAKE ICE STUDIES USING ERTS-1 MSS TOGETHER WITH NOAA-2 VHRR**

D. R. Wiesnet and D. F. McGinnis, Jr. /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 995-1009 refs

(Paper-W2) CSCL 08L

Five snow extent maps of the 5,601 sq km American River Basin were prepared using a Zoom Transfer Scope from ERTS-1 MSS band 4 imagery. The maps were generally completed within one hour. A snowmelt curve based on ERTS-1 imagery was used as a calibration standard or comparison for maps prepared from NOAA-2 VHRR imagery in the same manner. Cost comparisons with U-2 derived imagery indicate that ERTS-1 snow mapping of the basins is six times faster. Conservative estimates of comparable aircraft snow survey flights yields a cost figure 200 times that of the ERTS-1 snow map. Snow mapping attempts in the Lake Ontario Basin demonstrated that ERTS-1 is not well suited to large basins. Optimum size of basins for ERTS studies is believed to range from about 250 sq km to 30,000 sq km. The value of the ERTS-1 MSS for Great Lake ice evaluation was proved during the past winter on Lake Erie. Not only were ice features and types of ice identified, but melting ice was detected through the combined use of band 5 and band 7. Ice movement (direction and speed) was mapped by examining imagery from two successive days. Author

**N74-30778\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

## **ERTS-1 DATA IN SUPPORT OF THE NATIONAL PROGRAM OF INSPECTION OF DAMS**

G. E. Graybeal, F. G. Hall, B. H. Moore (Lockheed Electronics Co., Inc., Houston, Tex.), and E. H. Schlosser (Lockheed Electronics Co., Inc., Houston, Tex.) /In its 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1023-1039 refs

(Paper-W4) CSCL 08H

A computer-aided procedure, for use in the detection and location of areas of surface water, has been developed. The procedure was developed in support of the National Program of Inspection of Dams established by Public Law 92-367. The procedure utilizes data acquired by the unmanned Earth Resources Technology Satellite in conjunction with ancillary data in the form of topographic and highway maps, and meteorological data summaries. The procedure is divided into several distinct phases. A five-volume manual has been prepared to instruct potential users of the procedure. Author

**N74-30779\*** Texas Technological Univ., Lubbock.

## **DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS**

C. C. Reeves, Jr. /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1041-1069 refs

(Paper-W5) CSCL 08H

Three small playa lake basins on the Texas High Plains were originally selected as ERTS-1 test sites to attempt correlation of ERTS-1 imagery with the water balance ecosystem and

geology/morphology of the lake basins. The 5-mile long large Double Lakes playa complex was also instrumented as an alternate test site. Analysis of bands 6 and 7 of ERTS-1 MSS imagery shows that lake basins as small as 200 m in diameter (+ or - 10 acres) can be reliably classified as being wet or dry, thus supplying the methodology for a rapid, periodic census of surface water. A cost/benefit analysis reveals that the use of MSS imagery for such a census results in a 66 to 200-fold cost reduction when compared to the costs of using other conventional methods. Author

**N74-30780\*** Geological Survey, Miami, Fla.

## **WATER-MANAGEMENT MODELS IN FLORIDA FROM ERTS-1 DATA**

Aaron L. Higer, Alfred E. Coker, and Edwin H. Cordes /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1071-1088 refs

CSCL 08H

A prototype multiparameter data acquisition network, installed and operated by the U.S. Geological Survey is a viable approach for obtaining near real-time data needed to solve hydrologic problems confronting nearly 2.5 million residents of south Florida. Selected water quantity and quality data obtained from ground stations are transmitted for relay via ERTS-1 to NASA receiving stations in virtual real time. This data relay system has been very reliable and, by coupling the ground information with ERTS imagery, a modeling technique is available for water resource management in south Florida. An ecological model has been designed for the Shark River Slough in Everglades National Park. Author

## **N74-30781\*** Agricultural Research Service, Chickasha, Okla. **MEASURING WATERSHED RUNOFF CAPABILITY WITH ERTS DATA**

Bruce J. Blanchard /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1089-1098 ref

(Paper-W7) CSCL 08H

Parameters of most equations used to predict runoff from an ungauged area are based on characteristics of the watershed and subject to the biases of a hydrologist. Digital multispectral scanner, MSS, data from ERTS was reduced with the aid of computer programs and a Dicommed display. Multivariate analyses of the MSS data indicate that discrimination between watersheds with different runoff capabilities is possible using ERTS data. Differences between two visible bands of MSS data can be used to more accurately evaluate the parameters than present subjective methods, thus reducing construction cost due to overdesign of flood detention structures. Author

## **N74-30783\*** Department of the Environment, Ottawa (Ontario). **RETRANSMISSION OF WATER RESOURCES DATA USING THE ERTS-1 DATA COLLECTION SYSTEM**

R. A. Halliday, I. A. Reid, and E. F. Chapman /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1113-1126 refs

(Paper-W9) CSCL 08H

The Water Survey of Canada operates a network of approximately 2400 gauging stations at which water level data are collected. Nine DCPs were installed in isolated areas of northern and western Canada. It was felt that DCPs in these locations would be exposed to climatic conditions severe enough to provide a check on system reliability. Water level data are transmitted from all sites and, also, some of the DCPs are used to transmit ice break-up, water velocity, precipitation, air temperature, water stage recorder clock operation or DCP battery voltage. Consideration is being given to transmitting other parameters that would be of value in flood or flow forecasting. Results of the project have been excellent. There has been no data loss that can be attributed to failure of a DCP although data were lost because of sensor malfunctions. The quality of

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data collected compares favourably with that of the hard record obtained at the remote sites. Costs of using the ERTS Data Collection System are reasonable. Author

**N74-30784\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**ERTS-1 FLOOD HAZARD STUDIES IN THE MISSISSIPPI RIVER BASIN**

Albert Rango and Arthur T. Anderson *In its* 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1127-1166 refs

(Paper-W10) CSCL 08H

The Spring 1973 Mississippi River flood was investigated using remotely sensed data from ERTS-1. Both manual and automatic analyses of the data indicate that ERTS-1 is extremely useful as a regional tool for flood and floodplain management. The maximum error of such flood area measurements is conservatively estimated to be less than five percent. Change detection analysis indicates that the flood had major impacts on soil moisture, land pattern stability, and vegetation stress. Flood hazard identification was conducted using photointerpretation techniques in three study areas along the Mississippi River using pre-flood ERTS-1 imagery down to 1:100,000 scale. Flood prone area boundaries obtained from ERTS-1 were generally in agreement with flood hazard maps produced by the U.S. Army Corps of Engineers and the U.S. Geological Survey although the latter are somewhat more detailed because of their larger scale. Initial results indicate that ERTS-1 digital mapping of the flood-prone areas can be performed at least 1:62,500 which is comparable to conventional flood hazard map scales. Author

**N74-30785\*** Geological Survey, Washington, D.C.  
**OPTICAL DATA PROCESSING AND PROJECTED APPLICATIONS OF THE ERTS-1 IMAGERY COVERING THE 1973 MISSISSIPPI RIVER VALLEY FLOODS**

Morris Deutsch and F. H. Ruggles *In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1167-1188 refs*

(Paper-W11) CSCL 08H

Flooding along the Mississippi River and some of its tributaries was imaged by the multispectral scanner (MSS) on the Earth Resources Technology Satellite (ERTS-1) on at least three orbits during the spring of 1973. The ERTS data provided the first opportunity for mapping the regional extent of flooding at the time the imagery was acquired. Special optical data processing techniques were used to produce a variety of multispectral color composites which enhanced floodplain details. One of these, a two-color composite of near infrared bands 6 and 7, was enlarged and registered to 1:250,000-scale topographic maps and used as the basis for preparation of flood image maps. Two specially filtered three-color composites of MSS bands 5, 6, and 7 and 4, 5, and 7 were prepared to aid in the interpretation of the data. The extent of the flooding was vividly depicted on a single image by two-color temporal composites produced on the additive-color viewer using band 7 flood data superimposed on pre-flood band 7 images. Analysis of temporal data composites of the pre-flood and post-flood band 7 images indicate that changes in surface reflectance characteristics caused by the flooding can be delineated, thus making it possible to map the overall area flooded without the necessity of a real-time system to track and image the peak flood waves. Author

**N74-30786\*** Vermont Univ., Burlington.  
**APPLICATION OF ERTS IMAGERY TO ENVIRONMENTAL STUDIES OF LAKE CHAMPLAIN**

A. O. Lind *In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1189-1196 refs*

(Paper-W12) CSCL 08H

ERTS Imagery has provided data relating to a number of environmental and limnological concerns such as water quality, lake flooding and lake ice formation. Pollution plume data provided

by ERTS was recently used in the Supreme Court case involving the States of Vermont and New York and a paper company. Flooding of lowland tracts has been a major concern due to a repetitive pattern of high lake levels over the past three years, and ERTS imagery is being used to construct the first series of flood maps of the affected areas. Lake ice development and turbidity patterns have also been studied from ERTS, since these have significance for shore erosion studies. Author

**N74-30787\*** Corps of Engineers, Waltham, Mass.

**A REAL TIME DATA ACQUISITION SYSTEM BY SATELLITE RELAY**

Saul Cooper *In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1197-1212*

(Paper-W13) CSCL 08H

The overall aim was to evaluate the future usefulness of satellites in the performance of coordination and management functions related to the operation of flood control and other multipurpose projects in New England. Results on the data collection portion of the work are presented. The principal task was to develop statistics that demonstrate the relationship between conventional means of acquiring hydrologic data and the contribution made by using the satellite and its data collection platforms. Main interest was in determining the availability, reliability and usability of the data. Significant results on DCS show that the DCP's are reliable and useful and satellite data collection appears feasible on a nationwide basis. Author

**N74-30788\*** Geological Survey, Phoenix, Ariz.

**HYDROLOGIC APPLICATIONS OF ERTS-1 DATA COLLECTION SYSTEM IN CENTRAL ARIZONA**

Herbert H. Schumann *In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1213-1223*

(Paper-W14) CSCL 08H

The Earth Resources Technology Satellite (ERTS-1) Data Collection System (DCS) was used to relay hydrologic data (streamflow rates, precipitation amounts, soil and air temperature, and snow-moisture content) from remote sites in central Arizona to those responsible for reservoir management. The ERTS-DCS was utilized to furnish near-real time information on snow-moisture content and streamflow rates to the Salt River Project for use in the management and operation of reservoirs on the Salt and Verde Rivers. The Salt River Project, aided by near-real time hydrologic data furnished by both microwave and ERTS-telemetry, was successful in predicting the volume of runoff into the reservoirs. Serious flooding in the downstream Phoenix metropolitan area was prevented by prudent water management. Author

**N74-30789\*** American Univ., Washington, D.C. Dept. of Biology.

**APPLICATIONS OF ERTS DATA TO COASTAL WETLAND ECOLOGY WITH SPECIAL REFERENCE TO PLANT COMMUNITY MAPPING AND TYPING AND IMPACT OF MAN**

Richard R. Anderson, Virginia Carter, and John McGinness *In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1225-1242 refs*

(Paper-W15) CSCL 08H

Complete seasonal ERTS-1 coverage of Atlantic coastal wetlands from Delaware Bay to Georgia provides a basis for assessment of temporal data for wetland mapping, evaluation, and monitoring. Both MSS imagery and digital data have proved useful for gross wetland species delineation and determination of the upper wetland boundary. Tidal effects and (band to band or seasonal) spectral reflectance differences make it possible to type vegetatively coastal wetlands in salinity related categories. Management areas, spoil disposal sites, drainage ditches, lagoon-type developments and highway construction can be



detected indicating a monitoring potential for the future. A northern test site (Maryland-Virginia) and a southern test site (Georgia-South Carolina), representing a range of coastal marshes from saline to fresh, were chosen for intensive study. Wetland maps were produced at various scales using both ERTS imagery (bands 5 and 7) and digital data (bands 4, 5 and 7). Author

**N74-30791\*** National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.

**EVALUATION OF REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS**

Robert H. Cartmill *In its* 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1257-1277 refs  
(Paper-W17) CSCL 08H

This investigation has been conducted in the Atchafalaya River Basin of South Central Louisiana. This is a humid area of heavily forested swamps with a large volume of flow mostly from a diversion of the lower Mississippi River. Techniques to obtain enlarged imagery from computer compatible tapes of ERTS data without photographic enlargement is explained and illustrated. Techniques of extraction of environmental information from single bands and multiband pattern recognition procedures are explained and evaluated. A comparison of pattern recognition classifications of the Atchafalaya Basin by aircraft multispectral scanner and ERTS MSS data is made. Data for this comparison were gathered within three weeks of each other in the winter of 1973. Scorecards of the accuracy of the classifications are presented. Recommendations are made concerning the utilization of each sensor platform to perform specific tasks of wetlands characterization. Author

**N74-30795\*** Environmental Research Inst. of Michigan, Ann Arbor.

**UPDATING COASTAL AND NAVIGATIONAL CHARTS USING ERTS-1 DATA**

Fabian C. Polcyn and David R. Lyzenga *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1333-1346 refs  
(Paper-M4) CSCL 08B

A successful processing algorithm for extracting water depth information from ERTS data has been developed. Depth charts for two geographical areas have been constructed representing different solar illumination and water transparency conditions. Absolute depth calculations for water depth to 4.5 fathoms have been demonstrated for the Little Bahama Bank. Depth Charts also were constructed using data in Band 4 and 5 of the ERTS-1 MSS for areas in Lake Michigan. This data represented a low sun angle, poor light transmission in water conditions and gave useful results to 200 meters. In both cases, the ERTS map represented an update in shallow water detail in comparison with available navigation charts for the areas tested. Present processing costs to provide MSS depth charts are estimated to be on the order of \$1.50 per sq. mile. The updating of navigation charts for areas hazardous to shipping is an achievable direct application. Author

**N74-30796\*** Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Systems Div.

**SEDIMENT CONCENTRATION MAPPING IN TIDAL ESTUARIES**

A. N. Williamson and W. E. Grabau *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1347-1386 ref  
(Paper-M5) CSCL 08B

An analytical procedure has been developed that considers the ERTS-1 multispectral scanner as a reflectance spectrophotometer. ADP techniques requiring only very limited computer capability are utilized to search the data defining the spectral reflectance characteristics of a scene on a pixel-by-pixel basis, identify each pixel whose spectral reflectance matches a reference

spectrum, and generate maps that identify pixel locations where spectrum matches occur and identify the spectrum that was matched. If the reference spectra are known to represent a specific condition on the ground, a map of the distribution of that condition can be output as a dimensionally accurate overlay to maps of any selected scale. Two applications are described: (1) mapping the distribution of water masses exhibiting specific suspended sediment concentrations; and (2) determining the location and delineation of surface water bodies in the southeastern U. S. The techniques described are being successfully used to map the land area inundated by the 1973 spring flood in the Lower Mississippi River Valley, map sediment distributions in Lake Pontchartrain (in Louisiana) as a result of opening the Bonnet Carré Floodway during the spring flood, and inventory lakes and reservoirs. Author

**N74-30797\*** Delaware Univ., Newark.

**MONITORING COASTAL WATER PROPERTIES AND CURRENT CIRCULATION WITH ERTS-1**

V. Klemas, M. Otley, C. Wethe, and R. Rogers (Bendix Corp., Ann Arbor) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1387-1411 refs

(Paper-M6) CSCL 08C

Imagery and digital tapes from nine successful ERTS-1 passes over Delaware Bay during different portions of the tidal cycle have been analyzed with special emphasis on turbidity, current circulation, waste disposal plumes and convergent boundaries between different water masses. ERTS-1 image radiance correlated well with Secchi depth and suspended sediment concentration. Circulation patterns observed by ERTS-1 during different parts of the tidal cycle, agreed well with predicted and measured currents throughout Delaware Bay. Convergent shear boundaries between different water masses were observed from ERTS-1. In several ERTS-1 frames, waste disposal plumes have been detected 36 miles off Delaware's Atlantic coast. The ERTS-1 results are being used to extend and verify hydrodynamic models of the bay, developed for predicting oil slick movement and estimating sediment transport. Author

**N74-30798\*** Corps of Engineers, San Francisco, Calif.

**CALIFORNIA COASTAL PROCESSES STUDY**

Douglas M. Pirie and David D. Steller (Geosource Intern., Inc.) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1413-1466 refs

(Paper-M7) CSCL 08C

Preliminary findings are presented and applications derived from ERTS-1 satellite imagery of the nearshore coastal processes of the California coast. The objectives were to analyze nearshore currents, sediment transport, and estuarine and river discharges along the California coast through the use of synoptic and repetitive imagery from ERTS as well as aircraft underflights and surface data. The major conclusions are: (1) Distinct seasonal patterns for sediment transport as a function of the oceanic current systems and coastal morphology have been identified. (2) Large scale sediment plumes from intermittent streams and rivers extend offshore to previously unanticipated ranges. (3) Computer generated contouring of radiance levels from computer-compatible tapes result in charts that can be used for determination of surface and nearsurface suspended sediment distribution. (4) Flying spot scanner enhancements result in details of nearshore features. (5) Data is providing significant information for coastal planning and construction projects. Author

**N74-30799\*** Institut Geographique National, Hann-Dakar (Senegal).

**THE UTILIZATION OF ERTS-1 DATA FOR THE STUDY OF THE FRENCH ATLANTIC LITTORAL**

Pierre G. Demathieu and Fernand H. Verger (Lab. de Geomorphologie, Paris) *In* NASA. Goddard Space Flight Center 3d ERTS-1

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Symp., Vol. 1, Sect. B 1974 p 1447-1450  
(Paper-M8) CSDL 08C

The French Atlantic Littoral (FRALIT) program uses ERTS-1 data to study coastal geomorphology and waters. ERTS-1 gives an overall picture of the phenomena for the first time due mainly to channel 4 data, but the other channels also contribute valuable complementary data on superficial waters. These studies have already resulted in accurate maps of the mud transported south-westwards from the mouth of the River Loire. Author

**N74-30800\*** Alaska Univ., Anchorage.

### **ERTS IMAGERY APPLIED TO ALASKAN COASTAL PROBLEMS**

F. F. Wright, G. D. Sharma, D. C. Burbank, and J. J. Burns (Alaska Dept. of Fish and Game) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1451

(Paper-M9) CSDL 08C

Along the Alaska coast, surface water circulation is relatively easy to study with ERTS imagery. Highly turbid river water, sea ice, and fluvial ice have proven to be excellent tracers of the surface waters. Sea truth studies in the Gulf of Alaska, Cook Inlet, Bristol Bay, and the Bering Strait area have established the reliability of these tracers. ERTS imagery in the MSS 4 and 5 bands is particularly useful for observing lower concentrations of suspended sediment, while MSS 6 data is best for the most concentrated plumes. Ice features are most clearly seen on MSS 7 imagery; fracture patterns and the movement of specific floes can be used to map circulation in the winter when runoff is restricted, if appropriate allowance is made for wind influence. Current patterns interpreted from satellite data are only two-dimensional, but since most biological activity and pollution are concentrated near the surface, the information developed can be of direct utility. Details of Alaska inshore circulation of importance to coastal engineering, navigation, pollution studies, and fisheries development have been clarified with satellite data. ERTS has made possible the analysis of circulation in many parts of the Alaskan coast. Author

**N74-30810\*** Long Island Univ., Greenvale, N.Y.

### **AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS**

Edward Yost, R. Hollman, J. Alexander, and R. Nuzzi *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1607-1618 ref  
(Paper-E8) CSDL 08J

ERTS-1 photographic data products have been analyzed using additive color viewing and electronic image analysis techniques. Satellite data were compared to water sample data collected simultaneously with the data of ERTS-1 coverage in New York Bight. Prediction of the absolute value of total suspended particles can be made using composites of positives of MSS bands 5 and 6 which have been precisely made using the step wedge supplied on the imagery. Predictions of the relative value of the extinction coefficient can be made using bands 4 and 5. Thematic charts of total suspended particles (particles per litre) and extinction coefficient provide scientists conducting state and federal water sampling programs in New York Bight with data which improves the performance of these programs. Author

**N74-30833\*#** International Business Machines Corp., Huntsville, Ala.

### **A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME 2: SUPPORTING TECHNICAL DETAILS Final Report**

28 Jun. 1974 442 p refs  
(Contract NAS5-21942)  
(NASA-CR-139035; IBM-74W-00176-Vol-2) Avail: NTIS HC \$25.25 CSDL 08H

The Stanford Watershed Model, the Kentucky Watershed Model and OPSET program, and the NASA-IBM system for simulation and analysis of watersheds are described in terms of their applications to the study of remote sensing of water resources. Specific calibration processes and input and output parameters that are instrumental in the simulations are explained for the following kinds of data: (1) hourly precipitation data; (2) daily discharge data; (3) flood hydrographs; (4) temperature and evaporation data; and (5) snowmelt data arrays. The Sensitivity Analysis Task, which provides a method for evaluation of any of the separate simulation runs in the form of performance indices, is also reported. The method is defined and a summary of results is given which indicates the values obtained in the simulation runs performed for Town Creek, Alabama; Alamosa Creek, Colorado; and Pearl River, Louisiana. The results are shown in tabular and plot graph form. For Vol. 1, see N74-27813: A.A.D.

### **N74-30863** Joint Publications Research Service, Arlington, Va. **HYDROGRAPHIC INTERPRETATION OF PHOTOGRAPHS FROM SPACE**

T. G. Svatkova *In* its Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 162-167 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), No. 7, 1973 p 129-132

The information capacity of space photographs and the possibility of obtaining a number of morphometric characteristics of the lakes and rivers was investigated. The interpretation of the photography showed that the following possibilities existed: (1) determination of the completeness of the representation of the hydrographic network, (2) discovery of the possibility of drawing the watershed dividing lines, and (3) discovery of the individual attributes of the rivers and lakes which are reflected on the photograph and which can serve as the index of their regime. Author

**N74-31096#** Joint Publications Research Service, Arlington, Va.

### **METEOROLOGY AND HYDROLOGY, NO. 5, 1974**

24 Jul. 1974 212 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 3-126  
(JPRS-62559) Avail: NTIS HC \$13.75

Articles are presented on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, and the activities of the Soviet Hydrometeorological Service.

### **N74-31106** Joint Publications Research Service, Arlington, Va. **PROBABILITY CALCULATIONS OF THE DEPTH OF THE SNOW COVER CONSIDERING THE TERRITORIAL NONUNIFORMITY OF OCCURRENCE**

A. P. Sofiyan and A. I. Mazur *In* its Meteorol. and Hydrol., No. 5, 1974 (JPRS-62559) 24 Jul. 1974 p 115-123 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 80-85

The calculation is presented for the determination of the snow depth, and the probability of an arbitrary time, from the beginning of formation of the stable snow cover to the maximum snow accumulation. The territorial nonuniformity of its occurrence is shown in nomograms. It is demonstrated that the distribution of the snow cover depth in the general case is subject to gamma distribution. The normalization of the dynamic depth of the snow cover and the time of reckoning its occurrence permit a generalized characteristic of the snow accumulation. Author

### **N74-31113** Joint Publications Research Service, Arlington, Va. **OBSERVATIONS OF AVALANCHE MOVEMENT**

A. I. Korolev *In* its Meteorol. and Hydrol., No. 5, 1974

(JPRS-62559) 24 Jul. 1974 p 165-168 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 5, 1974 p 107-108

A description is presented of some of the peculiarities of movement of a wet avalanche revealed during observations directly near the head of the avalanche. The conclusion is drawn that the friction coefficient of the snow is different in different parts of the avalanche and depends on the size of the avalanche.

Author

**N74-31785\*** Alaska Univ., Fairbanks. Inst. of Water Resources.

**A STUDY OF THE BREAK-UP CHARACTERISTICS OF CHENA RIVER BASIN USING ERTS IMAGERY** Final Report, Jul. 1972 - Nov. 1973

Robert F. Carlson, Principal Investigator, Douglas L. Kane, and Gerd Wendler 14 Dec. 1973 38 p refs ERTS

(Contract NAS5-21833)

(E74-10675; NASA-CR-139242) Avail: NTIS HC \$5.00 CSCL 08H

The author has identified the following significant results. The Chena River Basin was selected because of the availability of ground truth data for comparison. Very good agreement for snow distribution and rates of ablation was found between the ERTS-1 imagery, the snowmelt model, and field measurements. Monitoring snowmelt rates for relatively small basins appears to be practical. The main limitation of the ERTS-1 imagery is the interval of coverage. More frequent overflights providing coverage are needed for the study of transient hydrologic events. ERTS-1 data is most useful when used in conjunction with snowmelt prediction models and existing snow course data. These results should prove very useful in preliminary assessment of hydrologic conditions in ungaged watersheds and will provide a tool for month-to-month volume forecasting.

**N74-31791\*** Geological Survey, Tacoma, Wash. **EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS** Semiannual Progress Report, 1 Jan. - 30 Jun. 1974

Mark F. Meier, Principal Investigator 1 Jul. 1974 7 p ERTS (NASA Order S-70243-AG-2)

(E74-10710; NASA-CR-139543) Avail: NTIS HC \$4.00 CSCL 08L

The author has identified the following significant results. Snowlines on a small (6 sq km) drainage basin were accurately measured without use of digital processing, and snow patches as small as 150 m (maximum dimension) were correctly identified, proving that the resolution of ERTS is ample for snow mapping needs. The area of snow cover on 10 individual drainage basins in the North Cascades, Washington, has been determined at 12 different times; these data can be used for more accurate forecasts of streamflow. Progress has been made in distinguishing snow in trees using multispectral analysis. Motion of the surging Tweedsmuir Glacier was measured. Velocities ranged from 2 to 88 m per day; a zone of intense crevassing also appeared to spread up and down the glacier (at about 200 m per day upglacier). This tentative result may be of great importance to an understanding of surging glacier dynamics. ERTS images also show that the most recent debris flow (20-21 August 1973) from Mount Baker can be clearly discerned and mapped, in order to monitor this potential hazard.

**N74-31803\*** Geological Survey, Reston, Va. Water Resources Div.

**DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO** Progress Report, 1 Mar. - 30 Apr. 1974

Edward J. Pluhowski, Principal Investigator 1 May 1974 3 p ERTS

(NASA Order S-70243-AG-2)

(E74-10722; NASA-CR-139555) Avail: NTIS HC \$4.00 CSCL 08H

The absence of turbidity plumes during the winter was well documented in an unusually successful sequence of images obtained February 10 - 12, 1974. Useful imagery of the south shore of Lake Ontario was obtained on 3 successive days at a time when sky cover over the area normally approaches complete coverage. Imagery of the Oswego, Genesee, and Niagara rivers failed to detect any plumes, however faint. Despite strong northwest winds on February 11 there was no indication of shoreline erosion generated by wave action. Frozen ground, snow cover, shoreline icing and minimal construction and farm activity without doubt reduces the probability of sediment movement in winter. Thunderstorm activity over the study area is very rare during the cold season so that the erosive energy of rainfall is greatly reduced. Moreover, a fairly high percentage of the winter precipitation is in the form of snow or sleet further reducing the impact of rainfall energy on sediment transport.

**N74-31855\*** Old Dominion Univ., Norfolk, Va. Dept. of Biology.

**THE USE OF COLOR INFRARED AERIAL PHOTOGRAPHY IN DETERMINING SALT MARSH VEGETATION AND DELIMITING MAN-MADE STRUCTURES OF LYNNHAVEN BAY, VIRGINIA** M.S. Thesis

Robert E. Holman, III Jun. 1974 51 p refs

(Grant NGL-47-003-067)

(NASA-CR-62099) Avail: NTIS HC \$5.75 CSCL 08H

Color infrared aerial photography was found to be superior to color aerial photography in an ecological study of Lynnhaven Bay, Virginia. The research was divided into three phases: (1) Determination of the feasibility of correlating color infrared aerial photography with saline wetland species composition and zonation patterns, (2) determination of the accuracy of the aerial interpretation and problems related to the aerial method used; and (3) comparison of developed with undeveloped areas along Lynnhaven Bay's shoreline. Wetland species composition and plant community zonation bands were compared with aerial infrared photography and resulted in a high degree of correlation. Problems existed with changing physical conditions; time of day, aircraft angle and sun angle, making it necessary to use several different characteristics in wetland species identification. The main characteristics used were known zonation patterns, textural signatures and color tones. Lynnhaven Bay's shoreline was 61.5 percent developed. Author

**N74-31861\*** South Dakota State Univ., Brookings. Remote Sensing Institute.

**REMOTE SENSING FOR EVALUATING POST-DISASTER DAMAGE CONDITIONS: THE PIERRE, SOUTH DAKOTA TORNADO, 23 JULY 1973**

Alvin E. Rusche and Victor I. Myers Aug. 1974 15 p refs (Grant NGL-42-003-007)

(NASA-CR-13962; SDSV-RSI-74-2) Avail: NTIS HC \$4.00 CSCL 02C

Remote sensing data obtained from aerial reconnaissance of tornado damage to the city of Pierre, South Dakota on July 23, 1973 was evaluated to determine its value as a decision making and management tool in post-disaster restoration activities. The imaging techniques used are briefly discussed, and both aerial and closeup color photographs are provided which were used in the evaluation. The immediate advantages of the data are identified as a 'quick-look' assessment, and a list is given which outlines the additional advantages for which positive rescue and cleanup action may be initiated. Hail and flood damage evaluation, and remote sensing of crop damage due to insect or disease infestation is also briefly described. A.A.D.

**N74-31881\*** National Oceanic and Atmospheric Administration, Washington, D.C.

**THE ROLE OF SATELLITES IN SNOW AND ICE MEASUREMENTS**

Donald R. Wiesnet Aug. 1974 14 p refs  
(NASA-CR-139671; NOAA-TM-NESS-58) Avail: NTIS  
HC \$4.00 CSCL 08L

Earth-orbiting polar satellites are desirable platforms for the remote sensing of snow and ice. Geostationary satellites at a very high altitude (35,900 km) are also desirable platforms for many remote sensors, for communications relay, for flood warning systems, and for telemetry of data from unattended instrumentation in remote, inaccessible places such as the Arctic, Antarctic, or mountain tops. Optimum use of satellite platforms is achieved only after careful consideration of the temporal, spatial, and spectral requirements of the environmental mission. The National Environmental Satellite Service will maintain both types of environmental satellites as part of its mission. Author

**N74-32768\*#** Virginia Inst. of Marine Science, Gloucester Point.  
**SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS Monthly Report, Jun. 1974**  
William J. Hargis and Maynard M. Nichols, Principal Investigators  
7 Aug. 1974 1 p EREP  
(Contract NAS6-2327)  
(E74-10739; NASA-CR-139629) Avail: NTIS HC \$4.00 CSCL 08J

**N74-32775\*#** Kansas Univ., Lawrence. Atmospheric Science Lab.  
**DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Aug. 1974**  
Joe R. Eagleman, Principal Investigator and Wen C. Lin 31 Aug. 1974 13 p refs EREP  
(Contract NAS9-13273)  
(E74-10749; NASA-CR-139989; TR-239-16) Avail: NTIS HC \$4.00 CSCL 04A

**N74-32793\*#** Lockheed Electronics Co., Plainfield, N.J.  
**DEVELOPMENT OF A TWO CHANNEL LINEAR DISCRIMINANT FUNCTION FOR DETECTING AND IDENTIFYING SURFACE WATER USING ERTS-1 DATA**  
Aug. 1973 36 p  
(Contract NAS9-122000)  
(NASA-CR-140221; JSC-08450) Avail: NTIS HC \$5.00 CSCL 08H

A method for detecting surface water using ERTS-1 multispectral scanner digital data is described. The several computer programs for processing multispectral data are described, along with the manner in which these programs were used. The use of the LARSAA program to test and demonstrate the discriminant function is explained. The discriminant function itself was later implemented in an operational program which performs only those specific operations necessary to test each data point for an indication of surface water in the scene. Several possible sources of difficulty in the use of the function are identified, and suggestions are made for avoiding or correcting those difficulties. Author

**N74-32795\*#** Lockheed Electronics Co., Houston, Tex.  
**PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 1: SUMMARY**  
Dec. 1973 54 p refs  
(Contract NAS9-12200)

(NASA-CR-140215; JSC-08454-Vol-1-Rev-A) Avail: NTIS HC \$5.75 CSCL 08H

Resource requirements for implementation of computer aided detection and location of surface water using ERTS 1 multispectral band scanner data are cited, along with suggestions for operational use of the information derived from the procedure. A summary is also provided for the separate program elements of data acquisition, control network establishment, computer program description and user's guide, and information correlation and interpretation. A.A.D.

**N74-33820\*#** Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).  
**A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA Quarterly Progress Report, May - Jul. 1974**  
C. E. Maffi, C. J. Simpson, and W. J. Perry, Principal Investigators  
15 Aug. 1974 6 p Sponsored by NASA EREP  
(E74-10744; NASA-CR-139984) Avail: NTIS HC \$4.00 CSCL 05B

The author has identified the following significant results. The stereo cover of the Skylab photos, their clarity, and their resolution put them far above the ERTS imagery not only in distinguishing between patterns but also in determining the nature of the country. The following land systems: (1) plains with sand dunes; (2) ridges, foothills, and alluvial plains; (3) dune-covered country with stony hills; and (4) alluvial plains were indistinguishable on the ERTS imagery. However, the same places are clearly distinguishable on the Skylab photos, together with the character of the dunes (parallel, reticulate, or irregular).

**N74-33822\*#** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.  
**PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Jun. - 31 Jul. 1974**  
John W. Hannah, Principal Investigator (Brevard County Planning Dept., Titusville, Fla.), Garland L. Thomas (Brevard County Planning Dept., Titusville, Fla.), Fernando Esparza, and James J. Millard 31 Jul. 1974 23 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(E74-10754; NASA-TM-X-70182) Avail: NTIS HC \$4.25 CSCL 08B

**N74-33877\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

## WATER RESOURCES

Vincent V. Salomonson In its 3rd ERTS Symp., Vol. 3 May 1974 p 52-82 refs  
CSCL 08H

Substantial progress has been made in applying ERTS-1 data to water resources problems, nevertheless, more time and effort still appear necessary for further quantification of results, including the specification of thematic measurement accuracies. More modeling can be done very profitably. In particular, more strategy models describing the processes wherein ERTS-1 data would be acquired, analyzed, processed, and utilized in operational situations could be profitably accomplished. It is generally observed that the ERTS-1 data applicability is evident in several areas and that the next most general and substantive steps in the implementation of the data in operational situations would be greatly encouraged by the establishment of an operational earth-resources satellite organization and capability. Further encouragement of this operational capability would be facilitated by all investigators striving to document their procedures as fully as possible and by providing time and cost comparisons between ERTS-1 and conventional acquisition approaches. Author

**N74-33924#** Earth Satellite Corp., Washington, D.C.  
**SNOW MAPPING AND RUNOFF FORECASTING: EXAMINATION OF ERTS-1 CAPABILITIES AND POTENTIAL BENEFITS FROM AN OPERATIONAL ERS SYSTEM** Interim Report  
 13 Mar. 1974 227 p refs  
 (Contract DI-14-08-001-13519)  
 (PB-232903/5; USGS-DO-74-009) Avail: NTIS HC\$6.00 CSCL 08L

Within the broad area of water resources management, the case study focused on snow mapping and related snow runoff forecasts, and particularly the potential benefits from use of improved runoff forecasts in reservoir regulation. Estimated benefits were based on a simulation of the impact of the errors in residual runoff forecasts upon determination of flood storage allocation. Benefits arise by avoiding excessive flood storage allocations and the resulting penalty cost in hydropower generation. The upper limit of potential residual runoff benefits are presented. GRA

**N74-34746\*#** Katholieke Universiteit te Leuven (Belgium). Dept. Geografie-Geologie.  
**LAKE TCHAD AND ZAIRE BASINS AND SURROUNDING AREAS: REGIONAL-GEOGRAPHIC AND GEOMORPHIC ANALYSES USING ERTS-SATELLITE IMAGERY**  
 J. Stercky, Principal Investigator 1974 9 p refs Sponsored by NASA ERTS  
 (E74-10779; NASA-CR-140132) Avail: NTIS HC \$4.00 CSCL 08F

**N74-34747\*#** Katholieke Universiteit te Leuven (Belgium). Lab. voor Experimentele Geomorfologie en Tropische Streken.  
**LAKE TCHAD AND ZAIRE BASINS AND SURROUNDING AREAS: REGIONAL-GEOGRAPHIC AND GEOMORPHIC ANALYSES USING ERTS-SATELLITE IMAGERY**  
 J. Sterckx, Principal Investigator 1974 12 p refs Sponsored by NASA ERTS  
 (E74-10780; NASA-CR-140133; Rept-3) Avail: NTIS HC \$3.25 CSCL 08F

**N74-34749\*#** Environmental Research and Technology, Inc., Lexington, Mass.  
**STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA** Quarterly Progress Report, 15 Jun. - 15 Sep. 1974  
 James C. Barnes, Principal Investigator Sep. 1974 5 p EREP (Contract NAS9-13305)  
 (E74-10782; NASA-CR-140135; QPR-6) Avail: NTIS HC \$3.25 CSCL 08L

**N74-34763\*#** Army Construction Engineering Research Lab., Champaign, Ill.  
**EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY** Bimonthly Progress Report, 9 Aug. - 8 Oct. 1974  
 R. K. Jain, Principal Investigator 8 Oct. 1974 1 p ERTS (NASA Order S-70255-AG)  
 (E74-10796; NASA-CR-140149) Avail: NTIS HC \$3.25 CSCL 08H

**N74-34769\*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

# **RADAR SIGNAL RETURN FROM NEAR-SHORE SURFACE AND SHALLOW SUBSURFACE FEATURES, DARIEN PROVINCE, PANAMA**

Bradford C. Hanson and Louis F. Dellwig Aug. 1973 22 p refs  
 (Contract NAS9-10261)  
 (NASA-CR-140291; CRES-TR-177-39) Avail: NTIS HC \$4.25 CSCL 17I

The AN/APQ-97 radar imagery over eastern Panama is analyzed. The imagery was directed toward extraction of geologic and engineering data and the establishment of operational parameters. Subsequent investigations emphasized landform identification and vegetation distribution. The parameters affecting the observed return signal strength from such features are considered. Near-shore ocean phenomena were analyzed. Tidal zone features such as mud flats and reefs were identified in the near range, but were not detectable in the far range. Surface roughness dictated the nature of reflected energy (specular or diffuse). In surf zones, changes in wave train orientation relative to look direction, the slope of the surface, and the physical character of the wave must be considered. It is concluded that the establishment of the areal extent of the tidal flats, distributary channels, and reefs is practical only in the near to intermediate range under minimal low tide conditions. Author

**N74-34818#** Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.  
**AREAL SNOW COVER OBSERVATIONS IN THE CENTRAL ROCKIES, COLORADO**  
 Arden D. Haefner and Charles F. Leaf Nov. 1973 20 p refs Sponsored in part by Dept. of Interior  
 (RM-5) Avail: NTIS HC \$4.00

Photographic records of areal snow cover depletion during the 1964-71 snowmelt seasons in the Fraser Experimental Forest, and in the Park Range from 1966-71, are summarized. Included are detailed estimates of snow cover extent on more than 90 hydrologic subunits which comprise the six watersheds photographed. Applications of these data in streamflow forecasting, water balance analyses, and snow cover duration are suggested. Author

**N74-35046#** Joint Publications Research Service, Arlington, Va.  
**METEOROLOGY AND HYDROLOGY NO. 7, 1974**  
 2 Oct. 1974 197 p refs Transl. into ENGLISH of Meteorol. Gidrol. (Moscow), no. 7, 1974 p 3-126  
 (JPRS-63109) Avail: NTIS HC \$13.00

Articles on microclimate, agricultural meteorology, weather forecasting, climate control, and hydrological forecasting are presented.

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## DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

**A74-30697** An approach to graphics system design. W. M. Newman and R. F. Sproull (Xerox Research Center, Palo Alto, Calif.). *IEEE Proceedings*, vol. 62, Apr. 1974, p. 471-483. 37 refs.

A discussion of some of the problems that arise in the design of high-level general-purpose device-independent graphics systems is presented. These problems are shown to be most easily solved by avoiding the use of complex display data structures prior to the picture transformation process. The use of a display file containing the transformed picture is proposed instead. This approach restricts the range of display equipment suitable for use as output devices but does not prevent the use of high-performance equipment. The use of a small set of high-level graphic input functions is also suggested and it is shown why this appears to be the best solution to the problem of programming graphic input devices. Included, too, is an outline description of a graphics system designed along the proposed lines.

(Author)

**A74-38540** Comparative evaluation of stereo radar techniques using computer generated simulated imagery. G. L. Bair and G. E. Carlson (Missouri, University, Rolla, Mo.). In: *NAECON '74*; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 13-15, 1974. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 220-227. 5 refs. Contract No. N00014-69-A-0141-0008. NR Project 387-069.

The performance of three stereo radar techniques for obtaining stereo image pairs is compared using computer generated pseudo-radar images. The techniques are: improved single-flight, previously proposed single-flight, and previously implemented two-flight. Improved stereo viewability was observed for the improved single-flight technique as compared with the previous single-flight technique, and both single flight techniques were better than the previously implemented two-flight technique. The improved stereo viewability of the single flight images results in terrain height measuring errors which are only 59% as large as those for the two-flight technique.

(Author)

**A74-39280 \* #** The first earth resources technology satellite /ERTS 1/. W. Nordberg (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973. East Germany, Akademie-Verlag GmbH, 1974, p. 259-273. 9 refs.

The present work describes the ERTS 1 spacecraft and data collection system and reviews the operation of the system since the satellite was launched in July, 1972. Perhaps the most significant result of the ERTS 1 mission is the realization that features related to land resources or to environmental processes can be mapped synoptically for very large areas on scales up to 1:250,000 without substantial loss of definition. Examples of color composite images obtained by ERTS 1 are shown.

P.T.H.

**A74-41120** Results of the Israeli multidisciplinary data analysis of ERTS-1 imagery. J. Otterman, G. Ohring, and A. Ginzburg (Tel Aviv University, Tel Aviv, Israel). *Remote Sensing of Environment*, vol. 3, no. 2, 1974, p. 133-148. 23 refs.

The results of analysis of Earth Resources Technology Satellite imagery of Israel and its vicinity are presented in the fields of arid

regions vegetation studies, oceanography, atmospheric and cloud studies, pollution observations, geology, and geomorphology. Assessment of usefulness of the four spectral bands of the Multi-Spectral Scanner, which produced the imagery, is presented. (Author)

**A74-42334 \*** Skylab multispectral scanner /S-192/ - Optical design and operational imagery. I. R. Abel and B. R. Reynolds (Honeywell Radiation Center, Lexington, Mass.). *Optical Engineering*, vol. 13, July-Aug. 1974, p. 292-298. Contract No. NAS9-11196.

Description of the design and performance of a multispectral scanner that makes possible photographic reproductions of actual flight recordings at an 80-meter resolution for an altitude of 440 km. Maximum scan pattern stability and instrument compactness have been achieved in the design.

M.V.E.

**A74-42810** The measurement and mapping of land-resource data by point sampling on aerial photographs. M. Alford, P. Tuley (Overseas Development Administration, Surbiton, Surrey, England), E. Hailstone, and J. Hailstone (Science Research Council, Atlas Computer Laboratory, Didcot, Berks., England). In: *Environmental remote sensing: Applications and achievements*; Proceedings of the Symposium, Bristol, England, October 2, 1972.

London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 113-126.

**A74-42863 #** Side-looking radar systems and their potential application to earth-resources surveys. I - Basic physics and technology. K. Grant (Easams, Ltd., Camberley, Surrey, England). *Revue Scientifique et Technique CECLES/CERS*, vol. 6, Apr.-June 1974, p. 117-136. 19 refs.

**N74-29544\*#** Illinois Univ., Urbana. Center for Advanced Computation.

**IMPLEMENTATION OF ILLIAC 4 ALGORITHMS FOR MULTISPECTRAL IMAGE INTERPRETATION Final Report, Mar. 1973 - Feb. 1974**

Robert M. Ray, John D. Thomas, Walter E. Donovan, and Philip H. Swain (Purdue Univ.) Jun. 1974 26 p refs  
(Grant NGR-14-005-202; Contract DAHCO4-75-C-0001; ARPA Order 1899)

(NASA-CR-139214; CAC-112) Avail: NTIS HC \$4.50 CSCL 05B

Research has focused on the design and partial implementation of a comprehensive ILLIAC software system for computer-assisted interpretation of multispectral earth resources data such as that now collected by the Earth Resources Technology Satellite. Research suggests generally that the ILLIAC 4 should be as much as two orders of magnitude more cost effective than serial processing computers for digital interpretation of ERTS imagery via multivariate statistical classification techniques. The potential of the ARPA Network as a mechanism for interfacing geographically-dispersed users to an ILLIAC 4 image processing facility is discussed.

Author

**N74-29725\*#** Maryland Univ., College Park. Computer Science Center.

**EDGE AND LINE DETECTION IN ERTS IMAGERY: A COMPARATIVE STUDY**

R. Eberlein, G. J. Vanderbrug, A. Rosenfeld, and L. S. Davis Jun. 1974 17 p refs  
(Grant NGR-21-002-351)

(NASA-CR-138963; TR-312) Avail: NTIS HC \$4.00 CSCL 14E

Several local edge detection operators were applied to a set of ERTS pictures of the Monterey, Calif. area. Gradient operators performed consistently better than laplacian operators in detecting edges. It was also found that if a grayscale normalization operation, histogram flattening, was applied to the pictures first, the edge detector outputs were greatly enhanced. The use of interpolation for more accurate location of edges on a digital picture was also briefly investigated. Curve detection operators were applied to the edge detector outputs; this had the effect of enhancing the edges while suppressing noise.

Author

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

**N74-30667\*#** Earth Satellite Corp., Berkeley, Calif.  
**PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY** Monthly Plans and Progress Report, 1 Apr. - 31 Jul. 1974  
 Charles E. Poulton, Principal Investigator 31 Jul. 1974 3 p EREP  
 (Contract NAS9-13286)  
 (E74-10674; NASA-CR-138840) Avail: NTIS HC \$4.00 CSCL 08B

**N74-30671\*#** Environmental Research Inst. of Michigan, Ann Arbor.  
**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY** Monthly Progress Report, Jun. 1974  
 Irvin J. Sattinger, Principal Investigator 1 Aug. 1974 2 p EREP  
 (Contract NAS9-13283)  
 (E74-10679; NASA-CR-139241; ERIM-103300-29-L) Avail: NTIS HC \$4.00 CSCL 08B

**N74-30673\*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.  
**STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA** Final Report, 18 Sep. 1972 - 28 Feb. 1974  
 William A. Deutschman, Principal Investigator Apr. 1974 32 p  
 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
 (Contract NAS5-21858)  
 (E74-10681; NASA-CR-139246) Avail: NTIS HC \$4.75 CSCL 05B

**N74-30677\*#** Sheffield Univ. (England). Dept. of Geography.  
**AN EVALUATION OF EREP (SKYLAB) AND ERTS IMAGERY FOR INTEGRATED NATURAL RESOURCES SURVEY**  
 J. L. VanGenderen, Principal Investigator Sep. 1973 25 p  
 refs Sponsored by NASA EREP  
 (E74-10685; NASA-CR-139252) Avail: NTIS HC \$4.25 CSCL 05B

The author has identified the following significant results. An experimental procedure has been devised and is being tested for natural resource surveys to cope with the problems of interpreting and processing the large quantities of data provided by Skylab and ERTS. Some basic aspects of orbital imagery such as scale, the role of repetitive coverage, and types of sensors are being examined in relation to integrated surveys of natural resources and regional development planning. Extrapolation away from known ground conditions, a fundamental technique for mapping resources, becomes very effective when used on orbital imagery supported by field mapping. Meaningful boundary delimitations can be made on orbital images using various image enhancement techniques. To meet the needs of many developing countries, this investigation into the use of satellite imagery for integrated resource surveys involves the analysis of the images by means of standard visual photointerpretation methods.

**N74-30678\*#** Sheffield Univ. (England). Dept. of Geography.  
**STEREO STUDY AS AN AID TO VISUAL ANALYSIS OF ERTS AND SKYLAB IMAGES**  
 J. L. VanGenderen, Principal Investigator Oct. 1973 11 p  
 refs Sponsored by NASA EREP  
 (E74-10686; NASA-CR-139253) Avail: NTIS HC \$4.00 CSCL 05B

The author has identified the following significant results. The parallax on ERTS and Skylab images is sufficiently large for exploitation by human photointerpreters. The ability to view the imagery stereoscopically reduces the signal-to-noise ratio. Stereoscopic examination of orbital data can contribute to studies of spatial, spectral, and temporal variations on the imagery. The combination of true stereo parallax, plus shadow parallax offer many possibilities to human interpreters for making meaningful analyses of orbital imagery.

**N74-30687\*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.  
**DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193** Monthly Letter Progress Report No. 11, Jul. 1974  
 Richard K. Moore, Fawwaz T. Ulaby, Principal Investigators, Arun Sobti, John C. Barr, Evan Davison, Chia Sung, Saad Ulaby, and Tom Burton Jul. 1974 23 p EREP  
 (Contract NAS9-13331)  
 (E74-10698; NASA-CR-139317) Avail: NTIS HC \$4.25 CSCL 05B

**N74-30697** Ludwig-Maximilians-Universitat, Munich (West Germany).  
**TOTAL AND VERTICAL-INTENSITY MEASUREMENTS ALONG AN ALPINE CROSS PROFILE AT THE NORTHERN PART OF THE GEODETICAL TRAVERSE 1a. PROFILE 11: SALZBURG, PASS LUEG, ST. JOHANN, HUETTSCHLAG** [VERMESSUNG DER TOTALINTENSITAET UND VERTIKAL-INTENSITAET LAENGS EINES ALPENQUERPROFILES AUF DEM NOERDLICHEN ABSCHNITT DER GEOTRAVERSE 1a. PROFIL 11: SALZBURG, PASS LUEG, ST. JOHANN, HUETTSCHLAG]

U. Bleil *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 - 1974 p 11-14 refs *In* GERMAN (For availability see N74-30694 20-13)

Evaluation of geological and geophysical measurements on the intensity of the geomagnetic anomaly in the vicinity of Berchtesgaden on the northern leg of the geotraverse 1a establishes a regional positive anomaly with intensities Delta T up to 150 gamma at a median width of about 40 km. Median fluctuations are + or - 10 gamma, maximal fluctuations + or - 50 gamma.  
 Transl. by G.G.

**N74-30725\*** Bureau of Land Management, Denver, Colo.  
**USEFULNESS OF ERTS-1 SATELLITE IMAGERY AS A DATA-GATHERING TOOL BY RESOURCE MANAGERS IN THE BUREAU OF LAND MANAGEMENT**  
 R. Gordon Bentley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 291-299 ref

(Paper-A18) CSCL 08B

ERTS-1 satellite imagery can be an effective data-gathering tool for resource managers. Techniques are developed which allow managers to visually analyze simulated color infrared composite images to map perennial and ephemeral (annual) plant communities. Tentative results indicate that ephemeral plant growth and development and potential to produce forage can be monitored.  
 Author

**N74-30729\*** National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.  
**COMPUTER-IMPLEMENTED LAND USE CLASSIFICATION WITH PATTERN RECOGNITION SOFTWARE AND ERTS DIGITAL DATA**  
 Armond T. Joyce *In its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 331-337  
 (Paper-L1) CSCL 09B

Significant progress has been made in the classification of surface conditions (land uses) with computer-implemented techniques based on the use of ERTS digital data and pattern recognition software. The supervised technique presently used at the NASA Earth Resources Laboratory is based on maximum likelihood rationing with a digital table look-up approach to classification. After classification, colors are assigned to the various surface conditions (land uses) classified, and the color-coded classification is film recorded on either positive or negative 9 1/2 in. film at the scale desired. Prints of the film strips are then mosaicked and photographed to produce a land use map in the format desired. Computer extraction of statistical information is performed to show the extent of each surface condition (land use) within any given land unit that can be identified in the



image. Evaluations of the product indicate that classification accuracy is well within the limits for use by land resource managers and administrators. Classifications performed with digital data acquired during different seasons indicate that the combination of two or more classifications offer even better accuracy.

Author

**N74-30751\*** Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).

**STRATIGRAPHIC SUBDIVISION OF THE TRANSVAAL DOLOMITE FROM ERTS IMAGERY**

Jan Grootenboer, Ken Eriksson (Univ. of Witwatersrand, Johannesburg), and John Truswell (Univ. of Witwatersrand, Johannesburg) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 657-664 refs

(Paper-G5) CSCL 08E

ERTS imagery has revealed the presence of broad stratigraphic subdivisions in the previously undifferentiated Transvaal Dolomite of the western Transvaal, Republic of South Africa. While detailed field mapping in areas of good outcrop, as well as borehole logging has recently led to the recognition of a stratigraphy in the Transvaal Dolomite of the central Transvaal, poor outcrop in the western Transvaal has to date prevented this. The ERTS-imagery, however, clearly reveals the presence of six, and in the far west seven, distinct stratigraphic zones extending along strike for a distance of at least 200 km. The investigation clearly demonstrates the potential applications of ERTS-imagery in geological studies, even in a country where the geology is supposedly well known.

Author

**N74-30754\*** New York State Museum and Science Service, Albany.

**EVALUATION OF ERTS IMAGERY FOR SPECTRAL GEOLOGICAL MAPPING IN DIVERSE TERRANES OF NEW YORK STATE**

Y. W. Isachsen, R. H. Fakundiny, and S. W. Forster *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 691-717 refs

(Paper-G8) CSCL 08G

Linear anomalies dominate the new geological information derived from ERTS-1 imagery, total lengths now exceeding 6000 km. Experimentation with a variety of viewing techniques suggests that conventional photogeologic analyses of band 7 results in the location of more than 97 percent of all linears found. The maxima on rose diagrams for ERTS-1 anomalies correspond well with those for mapped faults and topographic lineaments, despite a difference in relative magnitudes of maxima thought due to solar illumination direction. A multiscale analysis of linears showed that single topographic linears at 1:2,500,000 became segmented at 1:1,000,000, aligned zones of shorter parallel, en echelon, or conjugate linears at 1:500,000, and still shorter linears lacking obvious alignment at 1:250,000. Visible glacial features include individual drumlins, best seen in winter imagery, drumlinoids, eskers, ice-marginal drainage channels, glacial lake shorelines and sand plains, and end moraines.

Author

**N74-30760\*** Geological Research Dept., Randfontein (South Africa).

**ERTS-1 IMAGERY AS AN AID TO THE UNDERSTANDING OF THE REGIONAL SETTING OF BASE METAL DEPOSITS IN THE NORTH WEST CAPE PROVINCE, SOUTH AFRICA**

Richard P. Viljoen *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 797-806

(Paper-G15) CSCL 08G

A number of base metal finds have recently focussed attention on the North Western Cape Province of South Africa as an area of great potential mineral wealth. From the point of view of competitive mineral exploration it was essential that an insight into the regional geological controls of the base metal mineralization of the area be obtained as rapidly as possible. Conventional methods of producing a suitable regional geological map

were considered to be too time-consuming and ERTS-1 imagery was consequently examined. This imagery has made a significant contribution in the compilation of a suitable map on which to base further mineral exploration programmes. The time involved in the compilation of maps of this nature was found to be only a fraction of the time necessary for the production of similar maps using other methods. ERTS imagery is therefore considered to be valuable in producing accurate regional maps in areas where little or no geological data are available, or in areas of poor access. Furthermore, these images have great potential for rapidly defining the regional extent of metallogenic provinces.

Author

**N74-30761\*** Geological Survey, Reston, Va.

**MAPPING OF HYDROTHERMAL ALTERATION ZONES AND REGIONAL ROCK TYPES USING COMPUTER ENHANCED ERTS MSS IMAGES**

Lawrence C. Rowan, Pamela H. Wetlaufer, F. C. Billingsley (JPL), and Alexander F. H. Goetz (JPL) *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 807

(Paper-G16) CSCL 08E

A combination of digital computer processing and color compositing of ERTS MSS images has been used to map hydrothermal alteration zones and regional rock types in south-central Nevada. The technique is based on enhancement of subtle visible and near infrared reflectivity differences between mineralogically dissimilar rocks, especially unaltered and altered rocks. MSS spectral bands are ratioed, pixel by pixel, in the computer and subsequently stretched. These ratio values are used to produce a new black and white image which shows the subtle spectral reflectivity differences. Additional enhancement is achieved by preparing color composites of two or more stretched ratio images. The choice of MSS bands for rationing depends on the spectral reflectance properties of the rocks to be discriminated. Although this technique is in the initial stage of development and is untested in other areas, it already appears to have considerable potential for targeting mineral prospects and for regional geologic mapping.

Author

**N74-30762\*** Eason Oil Co., Oklahoma City, Okla.

**AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION**

Robert J. Collins, F. P. McCown, L. P. Stonis, Gerald Petzel, and John R. Everett *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 809-821 Prepared in cooperation with Earth Satellite Corp., Washington, D. C.

(Paper-G17) CSCL 08G

This experiment was designed to determine the types and amounts of information valuable to petroleum exploration extractable from ERTS data and the cost of obtaining the information using traditional or conventional means. It was desired that an evaluation of this new petroleum exploration tool be made in a geologically well known area in order to assess its usefulness in an unknown area. The Anadarko Basin lies in western Oklahoma and the panhandle of Texas. It was chosen as a test site because there is a great deal of published information available on the surface and subsurface geology of the area, and there are many known structures that act as traps for hydrocarbons. This basin is similar to several other large epicontinental sedimentary basins. It was found that ERTS imagery is an excellent tool for reconnaissance exploration of large sedimentary basins or new exploration provinces. For the first time, small and medium size oil companies can rapidly and effectively analyze exploration provinces as a whole.

Author

**N74-30817\*** Canadian Center for Remote Sensing, Ottawa (Ontario).

**AFFINE TRANSFORMATIONS FROM AERIAL PHOTOS TO COMPUTER COMPATIBLE TAPES**

F. G. Peet, A. R. Mack (Dept. of Agr., Ottawa), and L. S. Crosson

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

(Dept. of Agr., Saskatoon) /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1719-1724

(Paper-13) CSCL 02C

During the development of a project to estimate wheat production, it became necessary to pull data, corresponding to particular fields in a test site, off an ERTS computer compatible tape. Aerial photographs and topographic maps were on hand for the test site. A method was devised, using an affine transformation, to relate the aerial photographs or topographic maps to the tapes. One can thereby access data on the tape corresponding to regions covered by only a few pixels. The theory can be used for the registration of two tapes for the same area and for the geometric correction of images. Author

**N74-30819\*** Environmental Research Inst. of Michigan, Ann Arbor.

### **ADVANCED PROCESSING AND INFORMATION EXTRACTION TECHNIQUES APPLIED TO ERTS-1 MSS DATA**

William A. Malila and Richard F. Nalepka /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1743-1772 refs

(Paper-15) CSCL 05B

Conventional automatic data processing and information extraction techniques fall short of providing the information required by the user in some applications. For those cases, advanced techniques are needed to permit the extraction of the necessary information. Advanced techniques are described and examples of their application to ERTS-1 MSS data are provided. The techniques are designed to help overcome problems in location, mensuration, and classification accuracies which result from geometric distortions of the ERTS MSS data, the relatively coarse resolution of the sensor, and variations in atmospheric state over the region to be surveyed. It is shown that each of these factors can seriously degrade one's ability to extract necessary information. Further, it is shown that advanced techniques can alleviate the effects of these factors. Author

### **N74-30820\*** Forest Management Inst., Ottawa (Ontario). **INTERPRETATION OF ERTS-1 IMAGERY AIDED BY PHOTOGRAPHIC ENHANCEMENT**

U. Nielsen /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1773-1786

(Paper-16) CSCL 14E

Agfacontour film can be used to produce relatively economical enhancements of density differences recorded on film. Image interpreters often ask whether enhancement really increases the information content of the original images. Examples of ERTS-1 imagery enhancements show that it is possible to separate density levels which are not discernible by the human eye. It is stressed that these techniques do not replace the photo interpreter, but rather they aid him in the interpretation process. Subtle density variations are made to stand out and on objective classification of the densities forming the image is produced. Author

**N74-30821\*** Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.

### **A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS**

Robert H. Rogers, Keith Peacock, and Navinchandra J. Shah /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1787-1804 refs

(Paper-17) CSCL 05B

A technique is described by which ERTS investigators can obtain and utilize solar and atmospheric parameters to transform spacecraft radiance measurements to absolute target reflectance signatures. A radiant power measuring instrument (RPMI) and its use in determining atmospheric parameters needed for ground

truth are discussed. The procedures used and results achieved in processing ERTS CCTs to correct for atmospheric parameters to obtain imagery are reviewed. Examples are given which demonstrate the nature and magnitude of atmospheric effects on computer classification programs. Author

**N74-30822\*** Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

### **THE PENN STATE ORSER SYSTEM FOR PROCESSING AND ANALYZING ERTS DATA**

G. J. McMurtry, F. Y. Borden, H. A. Weeden, and G. W. Petersen /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1805-1822

(Paper-18) CSCL 05B

The Office for Remote Sensing of Earth Resources (ORSER) of the Space Science and Engineering Laboratory (SSEL) at The Pennsylvania State University has developed an extensive operational system for processing and analyzing ERTS-1 and similar multispectral data. Specific results obtained by using this system include a study of land use, discrimination between types of forest resources and vegetation, detection of previously unknown geologic faults and correlation of these with known mineral deposits and ground water, mapping of mine spoils in the anthracite region of eastern Pennsylvania, mapping of strip mines and acid mine drainage in Central Pennsylvania, agricultural land use mapping, and detection of gypsy moth infestation. Author

**N74-30823\*** TRW Systems, Redondo Beach, Calif.

### **ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION**

Curtis L. May /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1823-1835 refs

(Paper-19) CSCL 05B

The background and results of an investigation concerning the use of multispectral data compression in the ERTS program are presented. An average compression of greater than 2:1 has been achieved under the constraint of zero distortion in the reconstructed image, and four MSS tapes can be compressed to fill less than one reel of magnetic tape. A preliminary study of the hardware implementation of this processor proves the feasibility of compression at input bit rates of over 100Mbps. Author

**N74-30824\*** TRW Systems, Redondo Beach, Calif.

### **EVALUATION OF DIGITALLY CORRECTED ERTS IMAGES**

John E. Taber /In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1837-1843

(Paper-110) CSCL 09B

The discussion is limited to processes by which a set of data samples collected on a geometrically distorted grid can be converted to samples on a different precisely specified grid. It is assumed that a mathematical expression for the desired transformation already exists. Concern will be the effects on image quality (specifically loss of resolution, photometric accuracy, and miscellaneous aberrations) that result from various techniques used in accomplishing the resampling. The resampling techniques evaluated have included nearest neighbor, bilinear, cubic convolution, and various truncated versions of sinc (x). The conclusion is that cubic convolution yields substantially higher quality output data for scenes typically encountered and can, in some instances, substantially enhance one's ability to abstract information. Author

**N74-30826\*** Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

### **PRINCIPAL COMPONENTS COLOUR DISPLAY OF ERTS IMAGERY**

M. M. Taylor *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1877-1897 refs

(Paper-112) CSCL 14E

In the technique presented, colours are not derived from single bands, but rather from independent linear combinations of the bands. Using a simple model of the processing done by the visual system, three informationally independent linear combinations of the four ERTS bands are mapped onto the three visual colour dimensions of brightness, redness-greenness and blueness-yellowness. The technique permits user-specific transformations which enhance particular features, but this is not usually needed, since a single transformation provides a picture which conveys much of the information implicit in the ERTS data. Examples of experimental vector images with matched individual band images are shown. Author

**N74-30828\*** International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.

**SCENE CORRECTION (PRECISION TECHNIQUES) OF ERTS SENSOR DATA USING DIGITAL IMAGE PROCESSING TECHNIQUES**

Ralph Bernstein *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1909-1928 refs

(Paper-114) CSCL 09B

Techniques have been developed, implemented, and evaluated to process ERTS Return Beam Vidicon (RBV) and Multispectral Scanner (MSS) sensor data using digital image processing techniques. The RBV radiometry has been corrected to remove shading effects, and the MSS geometry and radiometry have been corrected to remove internal and external radiometric and geometric errors. The results achieved show that geometric mapping accuracy of about one picture element RMS and two picture elements (maximum) can be achieved by the use of nine ground control points. Radiometric correction of MSS and RBV sensor data has been performed to eliminate striping and shading effects to about one count accuracy. Image processing times on general purpose computers of the IBM 370/145 to 168 class are in the range of 29 to 3.2 minutes per MSS scene (4 bands). Photographic images of the fully corrected and annotated scenes have been generated from the processed data and have demonstrated excellent quality and information extraction potential. Author

**N74-30829\*** Kansas Univ. Center for Research, Inc., Lawrence. **SPECTRAL AND TEXTURAL PROCESSING OF ERTS IMAGERY**

R. M. Haralick and R. Bosley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1929-1969 refs

(Paper-115) CSCL 14E

A procedure is developed to simultaneously extract textural features from all bands of ERTS multispectral scanner imagery for automatic analysis. Multi-images lead to excessively large grey tone N-tuple co-occurrence matrices; therefore, neighboring grey N-tuple differences are measured and an ellipsoidally symmetric functional form is assumed for the co-occurrence distribution of multiimage greytone N-tuple differences. On the basis of past data the ellipsoidally symmetric approximation is shown to be reasonable. Initial evaluation of the procedure is encouraging. Author

**N74-30830\*** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. **DIGITAL IMAGE ENHANCEMENT TECHNIQUES USED IN SOME ERTS APPLICATION PROBLEMS**

Alexander F. H. Goetz and Fred C. Billingsley *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1971-1992 refs

(Paper-116) CSCL 14E

Enhancements discussed include contrast stretching, multi-ratio color displays, Fourier plane operations to remove striping and boosting MTF response to enhance high spatial frequency

content. The use of each technique in a specific application in the fields of geology, geomorphology and oceanography is demonstrated. Author

**N74-31095#** National Environmental Satellite Service, Washington, D.C.

**ENVIRONMENTAL SATELLITE IMAGERY, JUNE 1974 Key to Meteorological Records Documentation No. 5.4**

Jul. 1974 94 p refs

Avail: NTIS HC \$7.75

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

**N74-31789\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Jul. 1974**

Roger M. Hoffer, Principal Investigator Jul. 1974 3 p EREP (Contract NAS9-13380)

(E74-10707; NASA-CR-139540) Avail: NTIS HC \$4.00 CSCL 08F

**N74-31873\*#** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**RADIATIVE TRANSFER IN REAL ATMOSPHERES Technical Report, 1 Feb. - 31 Oct. 1973**

Robert E. Turner Jul. 1974 108 p refs

(Contract NAS9-9784)

(NASA-CR-140199; ERIM-190100-24-T) Avail: NTIS HC \$8.50 CSCL 04A

The problem of multiple radiation scattering in an atmosphere characterized by various amounts of aerosol absorption and different particle size distributions was investigated. The visible part of the spectrum was emphasized, including the effect of ozone absorption. An atmosphere bounded by a nonhomogeneous, Lambertian surface was also studied, along with the effect of background radiation on target in terms of various atmospheric and geometric conditions. Results of the investigation indicate that contaminated atmospheres can change the radiation field by a considerable amount, and that the effect of non-uniform surface significantly alters the intrinsic radiation from a target element. The implications of these results for the recognition processing of multispectral remote sensing data is discussed. Author

**N74-32647\*#** Purdue Univ., Lafayette, Ind. Lab. of Applications of Remote Sensing.

**IMPLEMENTATION AND EVALUATION OF ILLIAC 4 ALGORITHMS FOR MULTISPECTRAL IMAGE PROCESSING Final Report**

Philip H. Swain Jul. 1974 22 p refs

(Grant NGR-14-005-202)

(NASA-CR-139688; LARS-T-16-111273) Avail: NTIS HC \$4.25 CSCL 09B

Data concerning a multidisciplinary and multi-organizational effort to implement multispectral data analysis algorithms on a revolutionary computer, the Illiac 4, are reported. The effectiveness and efficiency of implementing the digital multispectral data analysis techniques for producing useful land use classifications from satellite collected data were demonstrated. Author

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

**N74-32715\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.  
**TECHNOLOGY EVALUATION OF CONTROL/MONITORING SYSTEMS FOR MIUS APPLICATION**  
L. Marion Pringle, Jr. Aug. 1974 65 p  
(NASA-TM-X-58135; JSC-08973) Avail: NTIS HC \$3.75 CSCL 09C

Potential ways of providing control and monitoring for the Modular Integrated Utility System (MIUS) program are elaborated. Control and monitoring hardware and operational systems are described. The requirements for the MIUS program and the development requirements are discussed. Author

**N74-32762\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Jul. 1974**

Richard F. Nalepka and William A. Malila, Principal Investigators  
21 Aug. 1974 2 p EREP  
(Contract NAS9-13280)  
(E74-10725; NASA-CR-139622; ERIM-101900-36-L) Avail: NTIS HC \$4.00 CSCL 05B

**N74-32792\*#** Lockheed Electronics Co., Houston, Tex.  
**EVALUATION OF COMPUTER-AIDED PROCEDURE FOR DETECTING SURFACE WATER**

Aug. 1973 64 p refs  
(Contract NAS9-12200)  
(NASA-CR-140214; JSC-08453) Avail: NTIS HC \$6.25 CSCL 08H

Results from an evaluation of a computer-aided procedure for processing ERTS-1 data to detect and locate surface water are presented. The procedure was evaluated using data from a study area in the vicinity of the Lake Somerville area in Washington County, Texas. The procedure consisted of (1) selecting water training fields, (2) aggregating the training samples together and clustering them into unimodal clusters, (3) computing the mean vector and covariance matrix for each cluster, (4) classifying all of the study area into classes corresponding to the clusters using the maximum likelihood classifier, and (5) thresholding out the nonwater pixels. Author

**N74-32794\*#** Lockheed Electronics Co., Plainfield, N.J.  
**DEVELOPMENT OF A COMPUTER-AIDED PROCEDURE FOR THE NATIONAL PROGRAM OF INSPECTION OF DAMS**

Aug. 1973 49 p ref  
(Contract NAS9-12200)  
(NASA-CR-140220; JSC-08449) Avail: NTIS HC \$5.50 CSCL 08H

An effort was undertaken to determine the utility of ERTS-1 MSS data, together with automatic data processing (ADP) techniques, to detect and locate surface water, and transfer the related technology to the Texas Water Rights Commission (TWRC). A test site was selected, ERTS-1 MSS and ancillary data obtained, and existent ADP classification programs applied. During the course of this effort a linear discriminant function was developed. The results were evaluated for potential candidates for a transferable procedure. A computer-aided technique using a linear discriminant function was selected and recommended, for inclusion in an operational system, which met detection and location criteria. Specifically, evaluation of the selected computer-aided procedure for the test site resulted in the detection of 100 percent of areas of surface water 10 acres or greater in areal extent and the geographic location of areas classified as water to a positional accuracy of 1000 feet or closer. The procedure was recommended for inclusion in an operational computer-aided procedure for transfer to TWRC. Author

**N74-32798\*#** Lockheed Electronics Co., Houston, Tex.  
**PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 4: COMPUTER PROGRAM DESCRIPTION AND USER'S GUIDE**

Nov. 1973 233 p refs  
(Contract NAS9-12200)  
(NASA-CR-140218; JSC-08452-Vol-4) Avail: NTIS HC \$14.75 CSCL 08H

The detection and mapping (DAM) package of computer programs designed for use with a project to detect and locate surface water from ERTS 1 multispectral band scanner (MSS) data is described, and a user's manual is provided to document the operation of each program in the package. Computer generated display of MSS data is considered, along with control network adjustments, and classification and mapping of ERTS 1 data. An in depth discussion of the computer input deck setup associated with each program is provided. A.A.D.

**N74-32799\*#** Lockheed Electronics Co., Houston, Tex.  
**PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 5: INFORMATION CORRELATION AND INTERPRETATION**

Nov. 1973 41 p refs  
(Contract NAS9-12200)  
(NASA-CR-140219; JSC-08639-Vol-5) Avail: NTIS HC \$5.00 CSCL 08H

A detailed discussion is presented of the steps involved with the manual processing of the output from the computer programs associated with the detection and location of surface water with ERTS 1 multispectral band scanner data. A description of the methodology required for correlation of the acquired information to base maps, and a discussion related to the interpretation of the correlated information as it pertains to the National Program of Inspection of Dams are also provided. Author

**N74-32826** Telespazio, S.p.A., Rome (Italy).  
**ON-BOARD AND GROUND DATA PROCESSING IN SPACELAB FOR EARTH RESOURCES**

G. Bressanin In *ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions*, 4 1973 35 p refs

Processing of spacelab earth resources data onboard and on the ground is discussed. Onboard data handling includes data acquisition, recording and storage, sensor monitoring and control, and data analysis. Data processing on the ground involves data handling, data compression, geometric transformations, image data preprocessing, pattern recognition, digital, optical, analog electronic and hybrid processing implementation, and data storage and retrieval. ESRO

**N74-32827** Laboratori della Geofisica della Litosfera, Milan (Italy).

**GEOSCIENTIFIC INTERPRETATION OF REMOTELY SENSED DATA**

R. Cassinis In *ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions*, 4 1973 16 p

Earth observation from space is divided into dynamic phenomena and static features. Examples of ERTS-1 images over Italy are discussed. Ground truth collection and seasonal factors are indicated and the possible use of spacelab for earth observations is outlined. ESRO

**N74-32874#** Control Data Corp., Minneapolis, Minn. Digital Image Systems Div.  
**ANALYSIS AND DEVELOPMENT OF DIGITAL MAPPING SYSTEM SOFTWARE Final Report**

Leon O. Bonrud, Kenneth W. Enstrom, Dale J. Pantan, and Michael O. Schroeder May 1974 123 p  
(Contract DAAK02-73-C-0287)  
(AD-781613; ETL-CR-74-5) Avail: NTIS CSCL 08/2

The report describes the work done in the area of digital stereo mapping under contract with the United States Army Engineer Topographic Laboratories. The philosophy and techniques developed by the Digital Image Systems Division of Control Data Corporation in the past have been applied to the design and implementation of a software system to be used in the development of algorithms that relate to the problem of digital stereo matching. The system is designed as a research tool with the basic characteristics of flexibility and simplicity incorporated into a block processing environment. The major tasks of data handling and stereo image matching are logically separate from one another and are further subdivided into versatile functional components that are easily interchangeable as new algorithms are developed. (Modified author abstract) GRA

**N74-32897\*** Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

**DATA PROCESSING IMPROVEMENTS FOR THE SKYLAB S-191 EREP SPECTROMETER**

Charles E. Campbell Jun. 1974 32 p

(Contract NAS9-12200)

(NASA-CR-140208; LEC-3580) Avail: NTIS HC \$4.75 CSCL 20F

The characteristics of the S-191 spectrometer (filter wheel infrared spectrometer) are discussed. Inherent deficiencies in previous spectrometers are described and the techniques for correcting the deficiencies are explained. The radiance errors caused by error in wavelength are identified and the effects on the accuracy of the spectrometer are described. It is stated that the most important source of error in the S-191 spectrometer is off-band radiation in which the detected radiation is far from the wavelength which is expected to be detected by the sensor at that particular time. A numerical analysis of the effects of off-band radiation is developed. Author

**N74-33828\*** Imperial Government of Iran, Tehran.

**APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN Quarterly Progress Report, Oct. 1972 - Jan. 1973**

Khosro Ebtehadi, Principal Investigator Jan. 1973 23 p refs  
Sponsored by NASA ERTS

(E74-10761; NASA-CR-140001) Avail: NTIS HC \$4.25 CSCL 08F

**N74-33847** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

**STUDIES ON THE APPLICATION OF CONTOUR FREQUENCIES OF SPECTRAL FUNCTIONS FOR GENERALIZED SMOOTHING OF MEASUREMENT DATA [UNTERSUCHUNGEN UEBER DIE VERWENDUNG VON GRENZFREQUENZEN VON SPEKTRALFUNKTIONEN FUER EINE GENERALISIERUNGSMASSEZAHL]**

Rolf Gerlach In its Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 5-17 refs In GERMAN; ENGLISH summary

A numerical examination considers to which extend the sampling distance of a digitized contour line is changed when smoothed by means of a gliding arithmetic mean. Author

**N74-33849** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

**EXPERIENCES FROM THE TEST APPLICATION OF THE GRADICON DIGITALIZER TO MAPPING [ERFAHRUNGEN BEIM TESTEINSATZ DES DIGITALISIERGERAETES GRADICON IN DER KARTOGRAPHIE]**

R. Harbeck In its Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 31-40 In GERMAN; ENGLISH summary

The Gradicon digitizer, which is working with an electronic-mechanical measuring slide system, has been tested concerning its applicability to cartography. The quality of this instrument has been checked mainly with regard to functional reliability, manipulability, capacity and precision. It is shown that this instrument fully corresponds with the mechanical and electronic digitizers that operate in the range of resolution of about 0.01 mm. Author

**N74-33850** Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

**EFFECTS OF HYSTERESIS AND OF INTERNAL TRANSFORMATION OF INCHES INTO METERS FOR THE ARISTOGRID DIGITIZER [EINFLUSSE DER HYSTERESE UND DER INTERNEN UMWANLUNG VON ZOLL IN METER BEIM ARISTOGRID-DIGITIZER]**

Theodor Johannsen In its Rept. on Mapping and Topographic Meas., Ser. 1 1973 p 41-49 refs In GERMAN; ENGLISH summary

During an inversion of the digitizing direction, the hysteresis (inversion effect) appearing with an analog digital conversion causes a displacement of the jump point between two neighboring digital units. The possibility, inherent in the digitizer, of converting the coordinates measured in inches into metric values causes jumps in the metric indicator by different groups of the metric unit of 0.01 mm, i.e. by 0.02 mm, 0.03 mm, or 0.04 mm. The effects of these influences on the measuring accuracy are described. Author

**N74-33880\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**INTERPRETATION TECHNIQUES**

James L. Dragg In its 3rd ERTS Symp., Vol. 3 May 1974 p 123-143 refs

CSCL 05B

The image enhancement and geometric correction and registration techniques developed and/or demonstrated on ERTS data are relatively mature and greatly enhance the utility of the data for a large variety of users. Pattern recognition was improved by the use of signature extension, feature extension, and other classification techniques. Many of these techniques need to be developed and generalized to become operationally useful. Advancements in the mass precision processing of ERTS were demonstrated, providing the hope for future earth resources data to be provided in a more readily usable state. Also in evidence is an increasing and healthy interaction between the techniques developers and the user/applications investigators. Author

**N74-33928\*** Illinois Univ., Urbana. Dept. of Civil Engineering.

**A COMPUTER PROGRAM PACKAGE FOR THE GEOMETRIC ANALYSIS OF ERTS-1 IMAGES Final Report**

Kam W. Wong Mar. 1974 204 p refs

(Contract DI-14-08-0001-12631)

(PB-232249/3; UIIU-ENG-74-2005) Avail: NTIS HC \$13.25 CSCL 08B

The report documents nine computer programs which were developed to perform geometric analysis of the RBV images generated from the ERTS-1 television system. These programs may be used for preflight and inflight calibration, distortion analysis using reseau or ground controls, distortion modeling by polynomials, and distortion correction by polynomials or distortion tables. The documentation for each program includes a program description, data input instruction, sample input data and program listing. These programs are also suitable for the geometric analysis of other photographic systems. Author (GRA)

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

**N74-34745\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES** Monthly Progress Report, Aug. 1974

Roger M. Hoffer, Principal Investigator Aug. 1974 5 p EREP (Contract NAS9-13380) (E74-10778; NASA-CR-140131) Avail: NTIS HC \$3.25 CSCL 08F

**N74-34755\*#** Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.

**SKYLAB MULTISPECTRAL PHOTOGRAPHY OF ITALIAN VOLCANOLOGY, GEOLOGY, RICE FIELDS, AND PALEO RIVER BEDS** Progress Report

R. Cassinis, Principal Investigator 6 Jun. 1974 9 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP (E74-10788; NASA-CR-140141; PR-2) Avail: NTIS HC \$3.25 CSCL 08F

**N74-34759\*#** TRW Systems Group, Redondo Beach, Calif. **EVALUATION OF DIGITAL CORRECTION TECHNIQUES FOR ERTS IMAGES** Final Report, Aug. 1972 - Feb. 1973

S. S. Rifman, Principal Investigator and D. M. McKinnon. Jul. 1974 83 p refs ERTS (Contract NAS5-21814) (E74-10792; NASA-CR-140145) Avail: NTIS HC \$7.25 CSCL 14E

**N74-34762\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA** Monthly Progress Report, Aug. 1974

Richard F. Nalepka and William A. Malila, Principal Investigators 17 Sep. 1974 2 p EREP (Contract NAS9-13280) (E74-10795; NASA-CR-140148; ERIM-101900-38-L) Avail: NTIS HC \$3.25 CSCL 05B

**N74-34764\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**USE OF COMPUTER-AIDED ANALYSIS TECHNIQUES FOR COVER TYPE MAPPING IN AREAS OF MOUNTAINOUS TERRAIN**

Roger M. Hoffer, Principal Investigator, Michael D. Fleming, and Paula V. Krebs (Colorado Univ., Boulder) 27 Aug. 1974 15 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21880; Grant NGL-15-005-112) (E74-10797; NASA-CR-140150) Avail: NTIS HC \$4.00 CSCL 08B

**N74-34771\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**PHOTOGRAPHY FROM SPACE TO HELP SOLVE PROBLEMS ON EARTH**

[1974] 19 p Original contains color illustrations (NASA-TM-X-70333) Avail: NTIS HC \$4.00 CSCL 14E

Varied uses of ERTS imagery are briefly discussed. Applications to mineral/land resources, environment, land use, water resources, maps/charts, marine resources, and agriculture/forestry/range resources are also provided. J.A.M.

**N74-35045#** National Environmental Satellite Service, Washington, D.C.

**ENVIRONMENTAL SATELLITE IMAGERY, JULY 1974**

Aug. 1974 98 p refs (KMRD-5.4) Avail: NTIS HC \$8.00

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

## INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

**A74-38054 #** Studies of the equatorial anomaly in the F-region and the upper ionosphere with spherical ion traps on the Intercosmos-2 satellite (Izsledvaniia na ekvatorialnata anomaliiia v oblastta F i v'vshnata ionosfera s pomoshchta na sferichni ionni uloviteli, postaveni na sp'nikia 'Interkosmos-2'). G. Gdalevich, B. Gorozhankin, I. Kutiev, D. Samardzhiev, and K. Serafimov. *B'lgarska Akademiia na Naukite, Geofizichni Institut, Izvestia*, vol. 19, 1974, p. 71-83. 39 refs. In Bulgarian.

**A74-38635 \*** Water quality by photographic analysis. S. A. Klooster and J. P. Scherz (Wisconsin, University, Madison, Wis.). *Photogrammetric Engineering*, vol. 40, Aug. 1974, p. 927-935. 15 refs. Grant No. NGL-50-002-127.

Positive correlation exists between reflectance of water and the water quality parameter of turbidity. This relationship holds for all times for a particular waste. At particular times other parameters such as suspended solids correlate to turbidity and can also be mapped. To analyze aerial photos properly to obtain water reflectance, a standard reflectance panel is needed somewhere in the frame. For this study color and color-infrared film are used and analyzed with a color microdensitometer which, with certain modifications, is also used to analyze reflectance of water samples. Noise in the analysis includes bottom effects, reflection from the air-water interface, and path luminance, but these can all be dealt with by proper techniques.

F.R.L.

**A74-38701 #** Aerial photography: Fundamentals and metrology (*Aerofotografiia: Osnovy i metrologiia*). A. S. Kuchko. Moscow, Izdatel'stvo Nedra, 1974. 272 p. 125 refs. In Russian.

The theory and metrological aspects of an aerial photographic process aimed at obtaining earth's surface pictures from an aircraft are discussed, covering modern aerial cameras and photographic materials. Attention is given to the various factors which have adverse effects on the metrological quality of aerial photo-images, on their feature description capacity and size-perception worthiness in particular. The brightness characteristics of the earth's surface and reflected radiation are considered along with the optical characteristics of the atmosphere. Technical details are given for the equipment and procedures of black-and-white and color aerial photography.

V.Z.

**A74-38802** Atmospheric corrections for airborne measurements of water surface temperature. C. L. Tien (California, University, Berkeley, Calif.). *Applied Optics*, vol. 13, Aug. 1974, p. 1745, 1746. NSF Grant No. GI-34932.

**A74-38983** Orbital international laboratory. Edited by E. A. Steinhoff. Tarzana, Calif., American Astronautical Society (Science and Technology Series. Volume 33), 1974. 305 p. \$20.

Results of visual observations of night, twilight, and day horizons of the earth from the Soyuz-9 spacecraft, spectrophotometry of the earth from manned spacecraft, and management of large multinational space operations are among the topics covered

in papers concerned with some of the international aspects of orbiting laboratories. Other topics covered include psychological aspects of operating large cooperative space ventures involving multinational crews, planning of an operational earth exploration satellite service, and earth resources research and its utilization by developing countries.

M.V.E.

**A74-38985** The large earth orbital space station - An international program. R. B. Demoret and G. W. Morgenthaler (Martin Marietta Aerospace, Denver, Colo.). In: *Orbital international laboratory*. Tarzana, Calif., American Astronautical Society, 1974, p. 39-61. 5 refs.

The organization, management, and purposes of a large earth-orbiting space station program to be established by a United Nations Earth Resources Agency with the broadest international participation is discussed. It is suggested that this agency coordinate the development of mathematical resource models, plan the science and flight mission programs, and coordinate the distribution of roles and responsibilities. A possible allocation of responsibilities to the U.S., USSR and other participating nations is presented along with a timetable for establishing such a program.

M.V.E.

**A74-39151 #** Thermal design, analysis and test of the ERTS-A spacecraft. F. O. Drummond and L. E. Blomstrom (General Electric Co., Philadelphia, Pa.). *SAE, AIAA, ASME, ASMA, and AIChE, Intersociety Conference on Environmental Systems, Seattle, Wash., July 29-Aug. 1, 1974, ASME Paper 74-ENAS-59*. 10 p. 5 refs. Members, \$1.00; nonmembers, \$3.00.

The thermal design, analysis, and testing of the Earth Resources Technology Satellite (ERTS-A) are presented, and flight temperature predictions are compared with flight performance. The temperature control requirements were to maintain a sink temperature for the payload and associated components of 20 plus or minus 10 C for payload duty cycles ranging from 0 to 20%. The requirements were met with a thermal design utilizing thermal coatings, multilayer insulation, radiators, louvers, and electrical compensation heaters. A multinode transient math model was established for the spacecraft and exercised to predict component temperatures and minimum and maximum thermal conditions. A solar thermal-vacuum thermal balance test of the entire spacecraft was performed to verify the adequacy of the thermal design to maintain spacecraft temperatures.

(Author)

**A74-39277 #** Biology and remote sensing from spacecraft. J. C. Zadoks and H. D. Frinking (Landbouwhogeschool, Wageningen, Netherlands). In: *Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973*. Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 41-46. 28 refs.

The biological uses of satellite-generated imagery are discussed in general terms. The main fields of interest are ecology, including natural vegetation, oceanography, and pollution, and natural resources, including agriculture, range lands, forestry, and fisheries. In the technical area of data collection, transmission, and storage, there is little to be desired, except better resolution. In the scientific area, there is much to be desired, especially with regard to the understanding of the interaction between living matter and radiation. New approaches are needed in teaching. Real progress will only be made when training in the application of remote sensing is offered, tailored to the biologist's needs.

P.T.H.

## 08 INSTRUMENTATION AND SENSORS

**A74-39283 #** National report of Switzerland on earth resources observation from satellite imagery. H. Haefner and K. Itten (Zürich, Universität, Zurich, Switzerland). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973. Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 413-419. 16 refs.

Earth resource studies which have been undertaken or are currently being conducted by Swiss researchers are briefly described. These include the use of Gemini photography for geographical applications, the use of ESSA-APT and Nimbus-HRIR pictures for observation and mapping of fast changing phenomena such as snow, ice, water, flood, rainfall pattern, and seasonal fluctuation of vegetational growth. Satellite pictures have been used for study of cloud patterns, circulation of air masses, and fog distribution. The Swiss ERTS 1 research program consists of a snow survey of the Swiss Alps, meteorological studies, and cartographic experiments.

P.T.H.

**A74-39284 #** Optical investigations from the manned spacecraft Vostkhod 2. A. I. Lazarev, A. A. Leonov, and M. M. Miroschnikov. In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973. Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 489-494. 13 refs.

A number of optical phenomena observed from Vostkhod 2 manned spacecraft at the earth's night and twilight horizon on 18-19 March 1965 and one phenomenon photographed on the earth's surface illuminated by the sun are described and interpreted. A supposition is made of observing the sun's corona near the earth's visible horizon, and the possibility of such an observation from space is analysed. The peculiarities of observing colour layers near the earth's twilight horizon are discussed. The earth's specular reflection at reflection angles close to 90 deg is described. The possibility of detecting noctilucent clouds from space on the earth's night side is discussed.

(Author)

**A74-39285 #** Preliminary results from Skylark earth resources rocket experiment in Argentina. D. D. Clark (Department of Trade and Industry, London, England), J. R. Hardy, A. J. Parsons, R. B. Ridgway, R. A. G. Savigear, and J. R. G. Townshend (Reading, University, Reading, Berks., England). In: Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973. (A74-39276 19-13) Berlin, East Germany, Akademie-Verlag GmbH, 1974, p. 495-499. Research supported by the Department of Trade and Industry.

In March 1973, an area of central Argentina of approximately 300,000 sq km was photographed from above 200 km altitude by means of cameras carried aloft in a double firing of a Skylark rocket. A ground survey program related to field-based crop identification and to sampling of the terrain was carried out at time of firing. The present work discusses briefly the interpretation of land use, cultural features, and natural resources of the area photographed on the basis of a print prepared from false color infrared. It was possible to distinguish between healthy green crops with high chlorophyll content, ripe mature crops, scrubland and natural pasture, stubble and fallow land, and bare soil.

P.T.H.

**A74-39601 \*** UCLA International Conference on Radiation and Remote Probing of the Atmosphere, University of California, Los Angeles, Calif., August 28-30, 1973, Proceedings. Conference sponsored by DOT, NASA, TRW Systems, U.S. Army, and University of California. Edited by J. G. Kuriyan (California, University, Los Angeles, Calif.). North Hollywood, Calif., Western Periodicals Co., 1974. 521 p. \$40.

Approaches for solving multiple scattering problems in planetary atmospheres are considered along with the solution of the radiative

transfer theory problems by the Monte Carlo method, the radiative transfer of visible radiation in turbid atmospheres, aspects of scattering and absorption from poly-dispersed aerosols, and multiple scattering in cloud layers. Other subjects discussed include particulate sizes from polarization measurements, lidar observations of atmospheric particulate content, methods of calculating infrared transfer, molecular absorption parameters in atmospheric modelling, and infrared remote sounding. The influence of the atmosphere on spectral radiance and contrasts of natural formations measured from space is investigated and analytical results for radiative transfer in thick atmospheres are presented.

G.R.

**A74-40493 #** On the measurement of in-cloud and wet-bulb temperatures from an aircraft. D. H. Lenschow and W. T. Pennell (National Center for Atmospheric Research, Boulder, Colo.). *Monthly Weather Review*, vol. 102, June 1974, p. 447-454. 13 refs.

The psychrometric equation generalized for high-speed flow is used to calculate the aerodynamic correction factor for a wet temperature sensor. The temperature difference between a wet and a dry thermometer in a saturated airstream moving at 70 m/sec is greater than 1 C. Aircraft measurements in clouds from 3 different temperature sensors are discussed. The temperature differences between an exposed and a protected thermometer are found to be as large as 1 C in conditions where the exposed thermometer is wet and the protected thermometer is dry. The outputs of the two sensors are well correlated in clear air but are uncorrelated in cloud. Humidity measured with a wet-bulb depression sensor is found to compare very well with the output of a dewpoint hygrometer in clear air. This sensor is also a good cloud indicator since the wet-bulb depression is about 0 only when the dry-bulb thermometer is completely wet.

(Author)

**A74-40982 #** Space research in Pakistan. COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 20 p. 10 refs.

**A74-41119** Passive sensing experiments and mapping at 3.3 mm wavelength. G. Schaerer (Bern, Universität, Berne, Switzerland). *Remote Sensing of Environment*, vol. 3, no. 2, 1974, p. 117-131. 20 refs.

The ability of a 3.3-mm radiometer to produce thermal images with a 10 arc-minutes resolution on a real-time display has been proved. The influence of the terrain and of the atmosphere on a picture taken from a ground-based antenna has been investigated. The range of zenith sky noise temperatures measured (40-240 deg K) is so large that a well recognizable object at low sky noise temperature (object on a natural terrain) may disappear completely for a heavy cloud cover. It is shown that the uniquely high angular resolution of this microwave radiometer permits the display of thermograms which approach the visual impression of optical images even under Fresnel conditions.

(Author)

**A74-42069 \*** Experiment planning during the Skylab missions. J. R. Sevier and R. A. Parker (NASA, Johnson Space Center, Houston, Tex.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-117*. 16 p.

The objectives of the Skylab Program included observations of the earth, the sun, the stars, and a comet in addition to a variety of engineering and medical experiments. Attention is given to mission planning activities accomplished before the launch of the orbital workshop, during the manned missions, and between manned



missions. Two major purposes of early experiments planning were related to the establishment of reasonable potential goals in terms of accomplishment and the discovery of potential problems in scheduling. Planning during the mission proceeded according to a scheme in which the planning was done on a daily basis. Experiences from the three Skylab missions are discussed separately. The results of the Skylab Program demonstrate the value of the daily experiment planning system that was capable of reacting to changing constraints.

G.R.

**A74-42074 \* #** Design and operation of the Skylab attitude and pointing control system. J. F. Applegate, J. M. McMillion, and R. E. Smith, Jr. (NASA, Marshall Space Flight Center, Systems Analysis and Integration Laboratory, Huntsville, Ala.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-126.* 24 p. 7 refs.

**A74-42085 \* #** Flight performance of the Skylab earth resources experiment package. A. E. Potter, A. L. Grandfield (NASA, Johnson Space Center, Applied Science Branch, Houston, Tex.), and C. K. Williams. *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-141.* 31 p. 8 refs.

The earth resources experiment package consisted of six facility-type sensors, which were flown on the Skylab spacecraft to collect data for a large group of investigators. For satisfactory interpretation of their data, many of these investigators required knowledge of the actual realized sensor performance, which may have differed from ground-based test performance. Functional, geometric, and radiometric evaluations of each sensor were made by using flight data from selected ground scenes, the moon, and dark space. As a result of these evaluations made during the Skylab missions, several sensor operation anomalies were identified and the appropriate corrective action was taken. (Author)

**A74-42089 \* #** Remote sensing of soil moisture by Skylab radiometer and scatterometer sensors. J. R. Eagleman and F. T. Ulaby (Kansas, University, Lawrence, Kan.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-146.* 15 p. 17 refs. Contract No. NAS-13273.

A Skylab experiment was designed to evaluate the feasibility of monitoring the moisture content of the soil from space. Data from various Skylab sensors were collected across two test sites while direct measurements of soil moisture were being made at the surface depths of soil. Correlations were obtained between the moisture content of the soil and radiometer sensors (S193 and S194) and the scatterometer instrument (S193). The high correlations obtained indicate that microwave sensors may be quite useful for such measurements in the future. (Author)

**A74-42275 \*** Finding the earth in ERTS. N. Gramenopoulos (Itek Corp., Lexington, Mass.). *Optical Spectra*, vol. 8, Aug. 1974, p. 26-28. 7 refs. NASA-sponsored research.

Itek's Optical System Division recently completed an investigation funded by NASA to develop interpretation methods and algorithms suitable for recognition of earth resources by machines using multispectral data from ERTS. Through the algorithms developed (and described here) it is now possible to automatically recognize terrain types. The clustering algorithm guarantees high accuracy in the recognition process with almost complete automation. Interestingly, the machine recognition seems to be more accurate than a human photointerpreter who has been restricted to using only ERTS-1 color composites. That is, machine recognition appears to be more sensitive, it can operate much closer, to the resolution limit of the ERTS-1 imagery than the human photointerpreter. F.R.L.

**A74-42279** Quantification of textures - Textural parameters and their significance for classifying agricultural crop types from colour aerial photographs. H. Maurer (Zürich, Universität, Zürich, Switzerland). *Photogrammetria*, vol. 30, Feb. 1974, p. 21-40. 24 refs.

**A74-42805** Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, University of Bristol, Bristol, England, October 2, 1972. Symposium supported by the University of Bristol. Edited by E. C. Barrett and L. F. Curtis (Bristol, University, Bristol, England). London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974. 314 p. \$27.50.

Subjects related to the study of rocks, soils, and landforms are considered, giving attention to the statistical assessment of resource surveys by remote sensors, the application of side-looking radar in earth-resource surveys, remote sensing in mineral exploration, the time factor in aerial photography for soil surveys in lowland England, and remote sensing for environmental planning surveys. Studies of land use, vegetation, and crops are discussed along with investigations of water, weather, and climate.

Individual items are announced in this issue.

G.R.

**A74-42806** Application of side-looking radar in earth-resource surveys. P. Martin-Kaye (Hunting Surveys, Ltd., Boreham Wood, England). In: *Environmental remote sensing: Applications and achievements; Proceedings of the Symposium, Bristol, England, October 2, 1972.* London, Edward Arnold (Publishers), Ltd.; New York, Crane, Russak and Co., Inc., 1974, p. 29-48. 7 refs.

Side-looking radar is a very valuable observational tool for the production of planimetric, geomorphic, land-use, vegetation, geological and other maps in regions where cloud or haze impede the recording of the earth's surface through the visible or infra-red. Much of the surface of the globe is dealt with more effectively and expeditiously by radar than by other currently operational remote sensing devices. Radar imagery has some characteristics that set it quite clearly apart from aerial photography. These characteristics must be borne in mind carefully, especially at first, in data interpretation exercises. A recent programme of radar-mapping in Nicaragua is used to illustrate in particular the principles of geological, vegetation and land-use interpretation of SLR imagery. Convenient modes of presentation of radar-map interpretive data are outlined by way of a conclusion. (Author)

**A74-43612** Airborne testing of advanced multisensor aircraft. L. Chabot, R. Wengler, and A. Mallow (Grumman Aerospace Corp., Bethpage, N.Y.). In: *Advancements in flight test engineering; Proceedings of the Fifth Annual Symposium, Anaheim, Calif., August 7-9, 1974.* Lancaster, Calif., Society of Flight Test Engineers, 1974, p. 2-95 to 2-128.

Recent attack aircraft designs, such as the A-6E, incorporate modern electro-optical sensors which, when combined with previous equipment, such as radar, provide multisensor aircraft. The electro-optical sensors involved include: forward-looking infrared (FLIR) devices, low-light-level television (LLTV) units, and laser transmitters and receivers. Typical flight test objectives for these devices included measurement of resolution and sensitivity of the FLIR and LLTV, and measurement of range and range accuracy using the laser transceiver. The necessary flight testing has involved the use of special preliminary ground tests, complex instrumentation and data processing, special targetry, and appropriate flight techniques. The special targetry was designed to allow evaluation of resolution, sensitivity, boresight, and other parameters. (Author)

**A74-43820** Laser applications. Volume 2. Edited by M. Ross (McDonnell Douglas Astronautics Co., St. Louis, Mo.). New York, Academic Press, Inc., 1974. 368 p. \$24.

Laser tracking systems are considered along with laser scanning systems, laser systems for monitoring the environment, and questions

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of integrated optics. Integrated optics is a far-reaching attempt to apply thin-film and integrated electronics technology to optical circuits and devices.

G.R.

**A74-43823** Laser systems for monitoring the environment. F. F. Hall, Jr. (NOAA, Wave Propagation Laboratory, Boulder, Colo.). In: Laser applications. Volume 2. New York, Academic Press, Inc., 1974, p. 161-225. 211 refs.

A laser systems analysis is conducted, giving attention to the lidar equation, the scattering of laser light, signal-to-noise calculations for a lidar system, lidar calibration methods, aspects of data display and evaluation, and safety problems. Approaches used in the laser detection of particulate matter in the environment are examined, taking into account turbidity, visibility investigations, diffusion studies in the atmosphere, clouds, fog, precipitation, polarization effects, and laser probing of the stratosphere and above. Laser sensing of turbulence and winds is discussed along with atmospheric constituent analysis with lasers and temperature measurements.

G.R.

**A74-44474** Elements of photogrammetry /with air photo interpretation and remote sensing/. P. R. Wolf (Wisconsin, University, Madison, Wis.). New York, McGraw-Hill Book Co., 1974. 573 p. \$18.50.

Aspects of optics related to photogrammetry are considered along with principles of photography, aerial cameras, vertical photographs, stereoscopic viewing, stereoscopic parallax, the planning of aerial photography, photogrammetric control, aerial mosaics, tilted photographs, and stereoscopic plotting instruments. Other subjects discussed include orthophotography, oblique and panoramic photographs, terrestrial and close-range photogrammetry, photogrammetric control extension, photographic interpretation, remote sensing, photographic measurements and refinement, and radial-line triangulation and planimetric map revision.

G.R.

**A74-44605 #** The interpretation of orbital imagery using the interpretoskop of VEB Carl Zeiss JENA. J. L. van Genderen (Sheffield, University, Sheffield, England). *Jena Review*, no. 19, no. 3, 1974, p. 177-181. 12 refs.

The Zeiss interpretoscope has been applied with great success to studies of orbital imagery obtained from ERTS and Skylab satellites. Interpretation and analysis of natural resources, and mapping of natural resources from space photographs were facilitated and simplified by the large magnification ability of the instrument and by its versatility in being able to handle both 23 by 23 cm and 70 by 70 mm film in paper and in transparency form. The advantages of stereo viewing of orbital images using the interpretoscope are pointed out.

V.P.

**A74-45876 #** Possibility of measuring elements of the earth's magnetic field on board drifting balloon (K vozmozhnosti izmereniia elementov magnitnogo polia zemli na bortu drefliruiushchikh aerostatov). Iu. P. Tsvetkov (Akademiia Nauk SSSR, Institut Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln, Krasnaya Pakhra, USSR). *Geomagnetizm i Aeronomiia*, vol. 14, July-Aug. 1974, p. 721-724. In Russian.

**A74-46261 \*** Satellite instrumentation for ocean surface measurements. J. Eckerman (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-29, 1974, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 34/2 1-34/2 8. 32 refs.

Sea surface observables for ocean dynamics applications are related to topography, physical structure, and the chemothermodynamic state. Radar sensors are required for the topography and

physical structure groups of observations. The characteristics of narrow band radar are considered, taking into account long pulse radar to measure wind speed and a long pulse radar-interferometer mode for wave sensing. Time domain radar techniques offer the alternative to determination of the sea surface structure by measuring the magnitude of the scattering cross-section. Multifrequency radiometric observations in the microwave visible and infrared spectral regions are required for ocean chemothermodynamic state measurements.

G.R.

**A74-46262 \*** Precision satellite altimetry. J. T. McGoogan (NASA, Wallops Station, Wallops Island, Va.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-29, 1974, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 34/3 1-34/3 7. 9 refs.

This paper is intended to provide a general background on the concept of precision altimetry, including geometry, measurement techniques and calibration. The altimeter project activities associated with the NASA Earth and Ocean Physics Program are presented. The present capabilities of various altimetry techniques will be discussed and supporting data presented.

(Author)

**A74-46263 \*** Satellite radar scatterometry. C. T. Swift and W. L. Jones, Jr. (NASA, Langley Research Center, Hampton, Va.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-29, 1974, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 34/4 1-34/4 6. 11 refs.

Questions of air-sea interaction are considered along with the theoretical results of an analysis of radar backscatter from the ocean and experimental measurements of radar backscatter. Scatterometer design specifications have been established based on user requirements of accuracy, swath width, resolution cell size, and a 100 km grid spacing of the measurements. The instrument errors associated with the fan beam mode of operation are shown in a graph.

G.R.

**A74-46264 \*** Satellite microwave radiometry. W. J. Webster, Jr., T. C. Chang, P. Gloersen, T. J. Schmugge, and T. T. Wilheit (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-29, 1974, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 34/5 1-34/5 6. 8 refs.

Recent technological developments have enabled application of the techniques of radio astronomy to problems of earth and ocean physics. To illustrate these applications, we review results from the 19.35 GHz Electrically Scanned Microwave Radiometer (ESMR) now in operation on Nimbus 5. A composite image of the earth made from ESMR observations taken between January 12 and January 16, 1973 illustrates the wide range of physical effects in single channel microwave observations. Multi-frequency observations made from aircraft have demonstrated an even greater potential for satellite radiometry when several frequencies and polarizations are used simultaneously. As an illustration of the considerations required in multi-channel radiometry, we discuss the choice of frequencies for the Scanning Multichannel Microwave Radiometer (SMMR) planned for the Nimbus G satellite.

(Author)

**A74-46750** Geoscience instrumentation. Edited by E. A. Wolff and E. P. Mercanti (NASA, Goddard Space Flight Center, Greenbelt, Md.). New York, Wiley-Interscience, 1974. 842 p. \$39.50.

Geoscience instrumentation systems are considered along with questions of geoscience environment, signal processing, data processing, and design problems. Instrument platforms are examined, taking into account ground platforms, airborne platforms, ocean platforms, and space platforms. In situ and laboratory sensors described include acoustic wave sensors, age sensors, atmospheric constituent sensors,

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biological sensors, cloud particle sensors, electric field sensors, electromagnetic field sensors, precision geodetic sensors, gravity sensors, ground constituent sensors, horizon sensors, humidity sensors, ion and electron sensors, magnetic field sensors, tide sensors, and wind sensors. Remote sensors are discussed, giving attention to sensing techniques, acoustic echo-sounders, gamma ray sensors, optical sensors, radar sensors, and microwave radiometric sensors.

G.R.

**N74-29685\*** National Oceanic and Atmospheric Administration, Rockville, Md. Photogrammetric Research Branch.

**SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY** Quarterly Report, 15 Apr. - 15 Jul. 1974

Morton Keller, Principal Investigator 15 Jul. 1974 1 p EREP (NASA Order T-4110-B)

(E74-10643; NASA-CR-138825) Avail: NTIS HC \$4.00 CSCL 08B

**N74-29692\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**[ACQUISITION AND PROCESSING OF DATA FROM THE SL-2 MISSION (EREP PASS NO. 7) OVER THE LAKE MONROE, INDIANA TEST SITE]** Yearly Report, Jul. 1973 - Jun. 1974

LeRoy F. Silva, Principal Investigator 26 Jul. 1974 4 p EREP

(Contract NAS9-13301)

(E74-10661; NASA-CR-138893) Avail: NTIS HC \$4.00 CSCL 05B

**N74-29701\*** Environmental Research and Technology, Inc., Lexington, Mass.

**EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB** Interim Final Report, May 1973 - Apr. 1974

David T. Chang, Principal Investigator Apr. 1974 18 p refs EREP

(Contract NAS9-13343)

(E74-10672; NASA-CR-139236) Avail: NTIS HC \$4.00 CSCL 04A

**N74-29723\*** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

**REMOTE PROFILING OF LAKE ICE THICKNESS USING A SHORT PULSE RADAR SYSTEM ABOARD A C-47 AIRCRAFT**

Dale W. Cooper, John E. Heighway, Donald F. Shook, Russell J. Jirberg, and Roger S. Vickers (Stanford Research Inst., Menlo Park, California) 1974 4 p ref Proposed for presentation at the 1974 Earth Environ. and Resources Conf., Philadelphia, 10-12 Sep. 1974

(NASA-TM-X-71588; E-8041) Avail: NTIS HC \$3.00 CSCL 08L

Design and operation of short pulse radar systems for use in ice thickness measurement are described. Two ice profiling systems were tested, an S system which used either random noise or continuous wave modulation at 2.8 GHz and a less powerful C band system which operated at 6.0 GHz and did not have random noise modulation. Flight altitudes of 4,000 feet were used, but the S band system was usable at 7,000 feet allowing flights in poor weather conditions. A minimum ice thickness of four inches is required for measurement, while the thickest ice measured was 36 inches. System accuracy is plus or minus one inch. E.J.O.

**N74-29739#** Florida Atlantic Univ., Boca Raton. Dept. of Geography.

**URBAN PATTERN RECOGNITION AND IMAGE COLOR DISCRIMINATION WITH TV WAVEFORMS AND COMPUTERIZED MATRIX ANALYSIS AND MAPPING** Final Report, 1970 - 1973

James P. Latham Mar. 1974 87 p refs

(Contract N00014-67-A-0320-0003; NR Proj. 389-151)

(AD-778043) Avail: NTIS CSCL 08/6

The report presents concepts, instrumentation techniques, methodology and experimental results of investigations which evaluated feasibility of applying black and white television and waveform signals to purpose of quantitatively recognizing, discriminating and mapping geographic patterns in imagery or in electronic signals via which such are transmitted. Colors in aerial photographs, or the environment, are discriminated and identified by combination of relative signal values when filters are used to gather the signal data. Four or less filters were required for 96 colors tested. Consequently, phenomena may be identified by color. Recognition of terrain, or land use, patterns found in an urbanized coastal environment is feasible. The technique is applicable to any pattern at any scale. Annotated bibliographic file of articles on computerized image processing published in geographic and photogrammetric journals from 1963 to 1973 is also presented. (Modified author abstract) GRA

**N74-29752#** Arkansas Univ., Fayetteville. Water Resources Research Center.

**BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT** Project Completion Report

W. P. Waite, K. R. Cook, and B. B. Bryan Nov. 1973 177 p refs

(Contract DI-14-31-0001-3557)

(PB-231558/8; OWRR-B-020-ARK(1); Publ-18; W74-07052; RR-23) Avail: NTIS HC \$4.75 CSCL 08H

A theoretical and experimental study of the microwave reflectivity of soils with varying moisture content was conducted. A system was developed to measure reflectivity over a continuous frequency range of 4 to 26.5 GHz, at incidence angles from 10 degrees to 70 degrees, and with both horizontal and vertical polarization. The measurements were found to be extremely accurate for smooth homogeneous surfaces, however, the effects of surface roughness were more severe than predicted due to the discontinuous nature of naturally occurring rough surfaces. (Modified author abstract) GRA

**N74-29755#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

**FEATURES OF LATERAL SCANNING FROM ARTIFICIAL EARTH SATELLITES (CHAPTER 4)**

N. I. Burenin 15 Apr. 1974 23 p refs Transl. into ENGLISH from the book "Radiolokatsionnye Stantsii s Sintezirov Annai Antennoi" USSR, 1972 p 145-159

(AD-779280; FTD-MT-24-781-74) Avail: NTIS CSCL 08/6

The characteristic conditions under which lateral scanning is performed are listed. The influence of these conditions on construction and operation of a lateral scanning radar is analyzed. E.J.O.

**N74-29759#** Utah State Univ., Logan. Center for Research in Aeronomy.

**MEASUREMENT OF ATOMIC OXYGEN IN THE MESOSPHERE** Final Report, 1 Dec. 1970 - 31 Dec. 1973

Laurence R. Thorne, Lawrence R. Megill, and William M. Moore 31 Dec. 1973 22 p refs

(Grant DA-ARO(D)-31-124-71-G107)

(AD-779492; AROD-9738-1-EN) Avail: NTIS CSCL 04/1

The oxidation rates of silver films by atomic oxygen and ozone have been examined and compared. The conductivities of the silver were measured as a function of the oxidation state.

## 08 INSTRUMENTATION AND SENSORS

Several factors make the results of these measurements appear complex, and calibrations are necessary for atmospheric use. The apparent autocatalytic nature of the reaction and resistance coating are examined in terms of a plausible mechanism. The increase in mass is amenable to direct correlation and confirms an initial rate law which is first order in the oxidation component. It was concluded that silver films are good detectors for atomic oxygen, and that ozone would not interfere with this measurement above an altitude of 38 km. Author (GRA)

**N74-29776\*** ITT Aerospace/Optical Div., Fort Wayne, Ind.  
**SURFACE COMPOSITION MAPPING RADIOMETER INSTRUMENT** Final Engineering/Project Report [1974] 144 p refs  
(Contract NAS5-21112)  
(NASA-CR-139034) Avail: NTIS HC \$10.25 CSCL 14B

The design, development, and fabrication of a three-channel scanning radiometer are discussed. The instrument was flown on Nimbus 5 satellite and measured infrared energy in the 8.3 to 9.3, 10.2 to 11.2, and 0.8 to 1.1 micron spectral regions. The instrument parameters are presented. Theoretical discussions of the instrument subassemblies are provided. Operational details of the mechanical and electrical portions of the instrument are included. Author

**N74-29780\*** Aerojet Electrosystems Co., Azusa, Calif.  
**DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 1: SYSTEM DEFINITION STUDIES** Final Design Report, 6 Jun. 1972 - 5 Jun. 1973

Jun. 1973 271 p refs  
(Contract DOT-CG-22170-A)  
(AD-779482; AESC-1745FR-1-Vol-1; USCG-D-45-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. The surveillance system consists of an X-band side-looking radar system, a 37 GHz passive microwave imaging system, a multispectral low light level TV system, a multichannel infrared line scanner, a position reference system, and a real-time processor/display console. Volume 1 describes the effort and results associated with the systems analysis and optimization effort. It includes investigation of annotation and navigation systems, various installation and pointing and stabilization techniques for low light level television camera, further investigation of alternative radar systems and various other areas. GRA

**N74-29781\*** Aerojet Electrosystems Co., Azusa, Calif.  
**DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 2: DESIGN REPORT** Final Design Report, 6 Jun. 1972 - 5 Jun. 1973

Jun. 1973 407 p refs  
(Contract DOT-CG-22170-A)  
(AD-779483; AESC-1745FR-1-Vol-2; USCG-D-46-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. Volume 2 gives details of the overall system design. GRA

**N74-29782\*** Aerojet Electrosystems Co., Azusa, Calif.  
**DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 3: SUBSYSTEM SPECIFICATIONS** Final Design Report, 6 Jun. 1972 - 5 Jun. 1973

Jun. 1973 156 p refs  
(Contract DOT-CG-22170-A)  
(AD-779484; AESC-1745FR-1-Vol-3; USCG-D-47-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. This volume is a compilation

of the specifications, drawing lists, Phase I and II Work Breakdown Structure and the Spare Parts List for the procured sensors. This documentation has been assembled in one area to serve as reference documentation for the various Phase I tasks. GRA

**N74-30665\*** Environmental Research Inst. of Michigan, Ann Arbor.

**DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA** Monthly Progress Report, Jun. 1974

Richard F. Nalepka and William A. Malila, Principal Investigators  
23 Jul. 1974 6 p EREP

(Contract NAS9-13280)

(E74-10667; NASA-CR-138997; ERIM-101900-34-L; MPR-16) Avail: NTIS HC \$4.00 CSCL 05B

**N74-30696** Ludwig-Maximilians-Universitat, Munich (West Germany).

**MEASUREMENT TECHNIQUE, VARIABLE REDUCTION AND NORMAL FIELD [MESSTECHNIK, VARIATIONSREDUKTION UND NORMALFELD]**

K. Wienert *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 3-5 refs In GERMAN

Geomagnetic field measurement techniques with torsion magnetometers, proton magnetometers and zero balance magnetometers are described probable error sources are considered and their normalizations are outlined. Transl. by G.G.

**N74-30696** Ludwig-Maximilians-Universitat, Munich (West Germany).

**GROUND MEASUREMENTS AND INTERPRETATION OF TWO Z ANOMALIES IN THE EARTH MAGNETIC FIELD NEAR INGOLSTADT AND VOHBURG ON THE DONAU [BODENVERMESSUNG UND INTERPRETATION ZWEIER Z-ANOMALIEN DES ERDMAGNETFELDES BEI INGOLSTADT UND VOHBURG AN DER DONAU]**

G. Schoenharting *In its* Meas. of Earth Magnetic Fields along Profiles in the Beginning Northern Alps and in the Alpine Mt. (delta Z, delta T), 1964 - 1973 1974 p 7-10 refs In GERMAN

Analyses of seismic reflections and gravimetric measurements on two magnetic anomalies indicate crystalline formations at depths of about 420 to 500 m. Magnetization parameters and the shape of the inclusions point to amphibolitic or gabbro-like basic formations; it is assumed that these are subvolcanic structures. Transl. by G.G.

**N74-30719\*** South Dakota State Univ., Brookings. Plant Science Dept.

**ERTS-1 MSS IMAGERY: ITS USE IN DELINEATING SOIL ASSOCIATIONS AND AS A BASE MAP FOR PUBLISHING SOILS INFORMATION**

Frederick C. Westin *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 183-204 refs

(Contract NAS5-21774)

(Paper-A12; SDSU-RSI-J-73-11) CSCL 08M

ERTS 1 imagery is a useful tool in the identification and refinement of soil association areas and an excellent base map upon which soil association information can be published. Prints of bands 5 and 7 were found to be most useful to help delineate major soil and vegetation areas. After delineating major soil areas, over 4800 land sale prices covering a period of 1967-72 were located in the soil areas and averaged. The soil association then were described as soil association value areas and published on a 1:1,000,000 scale ERTS mosaic of South Dakota constructed using negative prints of band 7. The map is intended for use by

state and county revenue officers, by individual buyers and sellers of land and lending institutions, and as a reference map by those planning road routes and cable lines and pipelines.

Author

**N74-30741\*** Geological Survey, Reston, Va. Geographic Applications Program.

**CARETS: AN EXPERIMENTAL REGIONAL INFORMATION SYSTEM USING ERTS DATA**

Robert H. Alexander *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 505-522 refs

(Paper-L13) CSCL 08F

The U. S. Geological Survey CARETS (Central Atlantic Regional Ecological Test Site)/ERTS investigation is testing the applicability of ERTS data as input to an environmental information system for a multi-state mid-Atlantic region surrounding the Chesapeake and Delaware Bays. The information system framework encompasses a flow of information through several stages from sensor to user, and involving evaluation and feedback from several potential users. Basic assumptions of the CARETS project model are that there is a measurable environmental impact associated with land use and land use change as determined with remote sensor data, and that the ERTS derived land use data sets, when properly calibrated, may thus provide regional planners and administrators with a shortcut to an understanding of the environmental changes that are going on in their regions.

Author

**N74-30744\*** Servicio Geologico de Bolivia, La Paz. **EARTH RESOURCES TECHNOLOGY SATELLITE DATA COLLECTION PROJECT, ERTS - BOLIVIA**

Carlos Brockmann *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 559-577 refs

(Paper-L16) CSCL 08B

The Earth Resources Technology Satellite program of Bolivia has developed a multidisciplinary project to carry out investigations in cartography and to prepare various thematic maps. In cartography, investigations are being carried out with the ERTS-1 images and with existing maps, to determine their application to the preparation of new cartographic products on one hand and on the other to map those regions where the cartography is still deficient. The application of the MSS images to the geological mapping has given more than satisfactory results. Working with conventional photointerpretation, it has been possible to prepare regional geological maps, tectonic maps, studies relative to mining, geomorphological maps, studies relative to petroleum exploration, volcanological maps and maps of hydrologic basins. In agriculture, the ERTS images are used to study land classification and forest and soils mapping.

Author

**N74-30782\*** Geological Survey, Harrisburg, Pa. **AN EVALUATION OF THE ERTS DATA COLLECTION SYSTEM AS A POTENTIAL OPERATIONAL TOOL**

Richard W. Paulson *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1099-1111 refs

CSCL 05B

The Earth Resources Technology Satellite Data Collection System has been shown to be, from the users vantage point, a reliable and simple system for collecting data from U.S. Geological Survey operational field instrumentation. It is technically feasible to expand the ERTS system into an operational polar-orbiting data collection system to gather data from the Geological Survey's Hydrologic Data Network. This could permit more efficient internal management of the Network, and could enable the Geological Survey to make data available to cooperating agencies in near-real time. The Geological Survey is conducting an analysis of the costs and benefits of satellite data-relay systems.

Author

**N74-30816\*** California Univ., Davis. Dept. of Electrical Engineering.

**MULTISPECTRAL COMBINATION AND DISPLAY OF ERTS-1 DATA**

Vidal Raphael Algazi *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1709-1717 refs

(Paper-I2) CSCL 05B

Standard NASA color composites combine the most relevant 3 bands from the 4 MSS bands available. An alternate approach is to extract the principal components of the data by a linear transformation of the 4 bands. This approach leads to a low dimensionality representation of ERTS-1 data with the least degradation, in the mean square sense, of the radiometric accuracy. The technique has been applied with success to ERTS-1 MSS data for several geographic areas in California. For all examples considered the mean square representation error is less than one percent. By combining this dimensionality reduction with our previous results on image enhancement for visual display, color composites are obtained which contain and display most of the information provided by the ERTS-1 sensors.

Author

**N74-30818\*** Stanford Research Inst., Menlo Park, Calif. **ESIAc: A DATA PRODUCTS SYSTEM FOR ERTS IMAGERY (TIME-LAPSE VIEWING AND MEASURING)**

William E. Evans and Sidney M. Serebreny *In* NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. B 1974 p 1725-1741

(PAPER-I4) CSCL 05B

An Electronic Satellite Image Analysis Console (ESIAc) has been developed for visual analysis and objective measurement of earth resources imagery. The system is being employed to process imagery for use by USGS investigators in several different disciplines studying dynamic hydrologic conditions. The ESIAc provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. The unique feature of the system is the capability to time-lapse the ERTS imagery and/or analytic displays of the imagery. Data products have included quantitative measurements of distances and areas, brightness profiles, and movie loops of selected themes. The applications of these data products are identified and include such diverse problem areas as measurement of snowfield extent, sediment plumes from estuary discharge, playa inventory, phreatophyte and other vegetation changes. A comparative ranking of the electronic system in terms of accuracy, cost effectiveness and data output shows it to be a viable means of data analysis.

Author

**N74-30851** Joint Publications Research Service, Arlington, Va. **STUDY OF TELEVISION PHOTOGRAPHS FROM SPACE: MEANS OF TECTONIC DISTRICTING**

I. I. Bashilova, G. V. Makhin, and V. K. Yerebin *In* its Space Phot. Surv. in Geol. Studies (JPRS-62383) 2 Jul. 1974 p 22-40 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geol. Razved. (Moscow), no. 7, 1973 p 19-33

The deciphering of space television images of the earth and subsequent geological interpretation of the results are discussed. The problems involved in defining specific geological areas from television images are discussed. A study was made of the basic results of using television photographs of the earth over two regions: (1) part of Southern Asia and (2) Western Siberia. When deciphering television space photographs, the tectonic map becomes the primary map and not a derivative document. The specific methods required to establish tectonic mapping as an independent form of study are analyzed with emphasis on the aerospace photographic method.

Author

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**N74-30885#** Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorologisches Inst.

**SPECTRAL RADIATION PROPERTIES OF THE ATMOSPHERE AND THE EARTH: PROFILES OF WATER VAPOR AND METHANE MIXING RATIOS FROM MEASUREMENTS WITH BALLOON BORNE INSTRUMENTS Final Report**

Peter Burkert, Dieter Rabus, and Hans-Jurgen Bolle Dec. 1973 30 p refs

(Grant AF-AFOSR-2282-72; AF Proj. 7621)

(AD-780526; AFCRL-TR-74-0240) Avail: NTIS CSCL 04/1

In previous reports a two channel filter radiometer has been described to be used for the determination of mixing ratios of minor constituents in the stratosphere from aboard a balloon or a sounding rocket. Two of these instruments were flown in a balloon on April 5, 1971. Besides testing the instruments the intention was to develop and test evaluation techniques for the transmission data from the instruments and get a first value of mixing ratio for water vapor and methane in the lower stratosphere. Evaluation techniques are described and water vapor and methane profiles between 12 and 30 km altitude are shown which were derived from the data of this balloon flight.

Author (GRA)

**N74-31054** Joint Publications Research Service, Arlington, Va. **STATISTICAL ASPECTS OF THE METEOROLOGICAL ANALYSIS OF INDUCTIVE AERIAL GEOPHYSICAL EXPLORATION SCHEMES**

A. F. Kotyuk *In its First All-Union Symp.* (JPRS-62432) 10 Jul. 1974 p 71-77 ref Transl. into ENGLISH of "Pervyy Vsesoyuznyy Simpozium, Metody Predstavleniya i Apparturnyy Analiz Sluchaynykh Protseessov i Poley" Novosibirsk, 1968 p 71-78

The problems involved in adapting airborne geophysical exploration equipment to meteorological investigations are analyzed. The development of methods of mathematical and physical modeling of processes that transpire in aerial electric geophysical exploration schemes is explained. Mathematical models are developed to show the signal processing capabilities which are required. The numerical analysis procedure leads to the possibility of studying the correlation function of the random process which represents a fluctuating voltage at the terminals of the receiving dipole and the effectiveness of the sampling equipment.

Author

**N74-31123#** Army Electronics Command, Fort Monmouth, N.J. **A HIGH RESOLUTION TEMPERATURE SONDE FOR THE LOWER ATMOSPHERE**

Ricardo Pena and Harry N. Schwartz May 1974 24 p refs (DA Proj. 1TO-61102-B-53A)

(AD-780084; ECOM-5541) Avail: NTIS CSCL 04/2

The paper describes a High Resolution Temperature Sonde (HRTS), developed by the Atmospheric Sciences Laboratory (ASL), and compares lower atmospheric temperature profiles measured by the HRTS to the same profiles measured by the standard radiosonde. Data from solid-state, light-weight HRTS's flown on Jimsphere balloons and tracked by a T-9 radar to provide altitude information, are discussed. Instrumentation associated with and calibration related to the HRTS are described. (Modified author abstract)

GRA

**N74-31787\*#** Kansas Univ., Lawrence.

**THE UTILITY OF SKYLAB S-190A AND B FOR MEASURING WATER QUALITY PARAMETERS IN KANSAS RESERVOIRS**

Harold L. Yarger, Principal Investigator and James R. McCauley 15 Aug. 1974 12 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-13271)

(E74-10696; NASA-CR-139537) Avail: NTIS HC \$4.00 CSCL 08H

**N74-31805\*#** Bureau of Reclamation, Denver, Colo.

**MONITOR WEATHER CONDITIONS FOR CLOUD SEEDING CONTROL Progress Report, 1 Mar. - 30 Apr. 1974**

Archib M. Kahan, Principal Investigator 1 May 1974 5 p ERTS

(NASA Order S-70243-AG-8)

(E74-10724; NASA-CR-139557) Avail: NTIS HC \$4.00 CSCL 04B

**N74-31808\*#** Environmental Research and Technology, Inc., Lexington, Mass.

**EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, May - Jul. 1974**

David T. Chang, Principal Investigator Jul. 1974 13 p refs EREP

(Contract NAS9-13343)

(E74-10729; NASA-CR-139575; QPR-5) Avail: NTIS HC \$4.00 CSCL 14B

**N74-31874\*#** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**A STUDY OF SOME NINE-ELEMENT DECISION RULES Final Report, 1 Feb. - 31 Oct. 1973**

Wyman Richardson Jul. 1974 46 p refs

(Contract NAS9-9784)

(NASA-CR-140203; ERIM-190100-32-T) Avail: NTIS HC \$5.50 CSCL 05B

A nine-element rule is one that makes a classification decision for each pixel based on data from that pixel and its eight immediate neighbors. Three such rules, all fast and simple to use, are defined and tested. All performed substantially better on field interiors than the best one-point rule. Qualitative results indicate that fine detail and contradictory testimony tend to be overlooked by the rules.

Author

**N74-31879\*#** Bendix Corp., Ann Arbor, Mich. System Div. **CONICAL SCAN IMPACT STUDY. VOLUME 1: GENERAL CENTRAL DATA PROCESSING FACILITY Final Technical Report, Apr. - Aug. 1973**

Donald H. Ebert, Thomas A. Eppes, and Douglas J. Thomas Sep. 1973 110 p refs

(Contract NAS5-21903)

(NASA-CR-139088; BSR-4150-Vol-1) Avail: NTIS HC \$8.50 CSCL 05B

The impact of a conical scan versus a linear scan multispectral scanner (MSS) instrument was studied in terms of: (1) design modifications required in framing and continuous image recording devices; and (2) changes in configurations of an all-digital precision image processor. A baseline system was defined to provide the framework for comparison, and included pertinent spacecraft parameters, a conical MSS, a linear MSS, an image recording system, and an all-digital precision processor. Lateral offset pointing of the sensors over a range of plus or minus 20 deg was considered. The study addressed the conical scan impact on geometric, radiometric, and aperture correction of MSS data in terms of hardware and software considerations, system complexity, quality of corrections, throughput, and cost of implementation. It was concluded that: (1) if the MSS data are to be only film recorded, then there is only a nominal conical scan impact on the ground data processing system; and (2) if digital data are to be provided to users on computer compatible tapes in rectilinear format, then there is a significant conical scan impact on the ground data processing system.

Author

**N74-31880\*** Bendix Corp., Ann Arbor, Mich. Systems Div. **CONICAL SCAN IMPACT STUDY. VOLUME 2: SMALL LOCAL USER DATA PROCESSING FACILITY** Final Technical Report, Jun. - Aug. 1973

Donald H. Ebert, P. E. Chase, Jack Dye, W. C. Fahline, and R. H. Johnson Sep. 1973 138 p refs

(Contract NAS5-21903)

(NASA-CR-139089; BSR-4150-Vol-2) Avail: NTIS HC \$10.00

The impact of a conical scan versus a linear scan multispectral scanner (MSS) instrument on a small local-user data processing facility was studied. User data requirements were examined to determine the unique system requirements for a low cost ground system (LCGS) compatible with the Earth Observatory Satellite (EOS) system. Candidate concepts were defined for the LCGS and preliminary designs were developed for selected concepts. The impact of a conical scan MSS versus a linear scan MSS was evaluated for the selected concepts. It was concluded that there are valid user requirements for the LCGS and, as a result of these requirements, the impact of the conical scanner is minimal, although some new hardware development for the LCGS is necessary to handle conical scan data. Author

**N74-31917#** Communications Research Centre, Ottawa (Ontario).

**FIELD TRIALS OF THE CRC UHF RADIOMETER AT CHURCHILL FALLS AND LAKE MELVILLE LABRADOR**

G. N. Reed and R. E. Barrington Jun. 1974 42 p refs

(CRC-1252) Avail: NTIS HC \$5.25

A series of field tests carried out with UHF radiometers in Labrador during the winter of 1972-1973 is described. The purpose of the experiment was to determine the value of radiometric techniques for the measurement of ice thickness on Lake Melville and for detecting Frazil ice concentrations in the reservoir of the Churchill Falls hydro-electric station. A comprehensive technical description is given of the two radiometer systems used in the experiment. A summary is made of the test program and the information derived from the analysis of the radiometer data is compared with ground-truth measurements. It is concluded that radiometers of the type used in these investigations are effective tools for detecting the build-up of Frazil ice in fast flowing waterways. They appear, however, to have limited value in the study of brackish ice such as that encountered on Lake Melville. Author

**N74-31938#** Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.

**EVALUATION OF A MICROWAVE-INDUCED PLASMA SPECTROMETER FOR TRACE ANALYSIS** Environmental Protection Technology Series

William Rudolf Seitz Jan. 1974 26 p refs

(PB-231390/6; EPA-660/2-73-009; W74-06841) Avail: NTIS MF \$1.45; SOD HC \$0.65 as EP123:660-2-73-009 CSCL 07D

A low pressure microwave-induced plasma in helium was evaluated as an excitation source for spectrochemical analysis of trace metals in water. The sample was introduced by evaporating a 5-microliter drop of solution on a wire filament and atomizing the solids by the discharge of a capacitor through the filament. The height of the resulting pulse from the photo detector was automatically recorded. Repeatability was about 10% and detection limits were 1 to 25 pg for As, Cd, Hg, and Pb. Slopes of calibration curves depended strongly on matrix and filament effects and the maximum solids loading of the filament was about 5 micrograms. GRA

**N74-32249\*** Teledyne Brown Engineering, Huntsville, Ala. **THERMAL MAPPING OF THE LUNAR SURFACE** Final Report

W. L. Raine Sep. 1973 110 p refs

(Contract NAS8-26343)

(NASA-CR-120367; EE-SSL-1767) Avail: NTIS HC \$8.50 CSCL 03B

A program of lunar infrared radiometry which uses large area scanning is described, and procedures for atmospheric attenuation correction and data reduction to temperature by relative radiometry are outlined. Flow charts of the computer data reduction program are shown which contain the astrometric analysis from ephemeral data. The scan data, taken on 10 evenings in 1971 and 1972 in the 10 to 12 micron window, are presented as isothermal contour maps of the lunar disc. More than 160 areas of anomalous thermal emission were found in the lunar darkside data. Eclipse cooling curves, measured in the same wavelength band for 7 lunar regions during the eclipse of February 10, 1971, are also presented. Errors of the scan and eclipse data were calculated from accuracy estimates of the parameters. Author

**N74-32763\*** Sheffield Univ. (England). Dept. of Geography. **STEREO STUDY AS AN AID TO VISUAL ANALYSIS OF ERTS AND SKYLAB IMAGES**

J. L. VanGendern, Principal Investigator Nov. 1973 10 p refs Sponsored by NASA EREP

(E74-10734; NASA-CR-139624) Avail: NTIS HC \$4.00 CSCL 05B

The author has identified the following significant results. The parallax on ERTS and Skylab images is sufficiently large for exploitation by human photointerpreters. The ability to view the imagery stereoscopically reduces the signal-to-noise ratio. Stereoscopic examination of orbital data can contribute to studies of spatial, spectral, and temporal variations on the imagery. The combination of true stereo parallax, plus shadow parallax offer many possibilities to human interpreters for making meaningful analyses of orbital imagery.

**N74-32781#** Joint Publications Research Service, Arlington, Va.

**GEOPHYSICAL EQUIPMENT AND MEASUREMENTS**

A. Ya. Rotshteyn 19 Aug. 1974 15 p refs Transl. into ENGLISH from Geofiz. App. (Leningrad), no. 53, 1973 (JPRS-62753) Avail: NTIS HC \$4.00

The use of a self-oscillating quantum magnetometer, a transistorized ultrashort wave generator for quantum magnetometers, and a heat-stabilization system for the absorption chambers of a cesium quantum magnetometer are described. Author

**N74-32796\*** Lockheed Electronics Co., Houston, Tex. **PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 2: DATA ACQUISITION**

Nov. 1973 34 p refs

(Contract NAS9-12200)

(NASA-CR-140216; JSC-08638-Vol-2) Avail: NTIS HC \$4.75 CSCL 08H

The various ERTS 1 data products, recommended selection criteria, and screening aids are presented for use with a computer aided technique for detection and location of surface water from multispectral band scanner data. The maps of different types and scales which are needed during several phases of the procedure are discussed in terms of their functional requirements, series availability, and output considerations. Guidelines governing the availability of data, and procedures for ordering all data and ancillary information are outlined. Author

**N74-32797\*** Lockheed Electronics Co., Houston, Tex. **PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 3: CONTROL NETWORK ESTABLISHMENT**

Nov. 1973 53 p refs

(Contract NAS9-12200)

(NASA-CR-140217; JSC-08451-Vol-3) Avail: NTIS HC \$5.75 CSCL 08H

## 08 INSTRUMENTATION AND SENSORS

Multispectral digital data characteristics, and the criteria for establishing a control network are discussed as necessary elements in the implementation of a computer aided program for detection and location of surface water using ERTS 1 multispectral band scanner (MSS) data. The transformation of MSS data into a static, earth oriented coordinate system is described, and the approximate coefficients derived from system measurements of spacecraft orbit and attitude, and of scanner geometry, are given. Author

**N74-32806\*** Techtran Corp., Glen Burnie, Md.  
**MULTISPECTRAL SCANNING SYSTEM IN AN AIRCRAFT EXPERIMENT TO RESEARCH EARTH RESOURCES**

G. A. Avanesov, I. V. Barinov, and V. D. Glazkov Washington NASA Sep. 1974 11 p Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 4, Apr. 1974 p 30-36

(Contract NASw-2485)  
(NASA-TT-F-15684) Avail: NTIS HC \$4.00 CSCL 14B

The systems comprising a preliminary model of the experimental complex for acquisition and processing of video information are described. Preliminary results of the experiment are given. Author

**N74-32812** Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

**INTRODUCTION. OVERALL OBJECTIVE OF EARTH RESOURCES SURVEYS**

J. Bodechtel In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 10 p

Tasks concerning global earth observation by spaceborne remote sensing techniques are discussed. Ground, airborne, and spaceborne observation from platforms is discussed and the role of spacelab in a remote sensing program is defined. ESRO

**N74-32813** Kansas Univ., Lawrence. Remote Sensing Lab.  
**PHYSICS OF REMOTE SENSING**

Richard K. Moore In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 37 p

Classification of sensors in terms of sources, wavelengths, and methods for obtaining resolution is discussed. Mechanisms for emission and scatter are dealt with and atmospheric effects are elaborated upon. Methods for achieving resolution are presented. ESRO

**N74-32814** European Space Research Organization, Paris (France).

**EARTH RESOURCES AND MANNED SPACE SYSTEMS. THE ROLE FOR SPACELAB**

J. Plevin In its The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 17 p refs

The history of manned space flights, with particular reference to earth observations, is reviewed. The role of spacelab for earth resources surveys is outlined, notably in regard to shuttle and sortie missions. Earth resources payloads, including facility sensors such as side-looking radar, passive microwave sensors and multispectral scanners, standard support sensors, and experimental sensors are discussed. ESRO

**N74-32816** Physics Lab. RVO-TNO, The Hague (Netherlands).  
**GENERAL ASPECTS OF THE TECHNOLOGY OF REMOTE SENSING. AN INTRODUCTION**

G. P. deLoor In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 25 p refs

Remote sensing of earth resources from aircraft is discussed. Imaging techniques are dealt with. Criteria for observation are given and several examples of images are discussed. ESRO

**N74-32817** European Space Research Organization, Paris (France).

**PHOTOGRAPHY AND SPACELAB APPLICATION**

R. Haydn In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 28 p refs

The role of photography in spacelab is discussed, notably in regard to: (1) the spectral domain of photography; photographic film, photographic filters, monoband photography, multiband photography; and (2) the geometric domain of photography; the focus of the lens system. Spacelab as a data storage platform is reviewed and evaluation techniques of photographic data are dealt with. ESRO

**N74-32818** Plessey Co., Ltd., Havant (England).

**THE APPLICATION OF MULTISPECTRAL SENSING TO THE EUROPEAN SPACELAB PROJECT**

A. D. Higham In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 23 p

The use of multispectral sensing in the European spacelab project is dealt with. The sensing process is described and typical multispectral sensors are discussed. Spectral characteristics of vegetation, rocks, water, soils, and their variation with environmental parameters are described. Basic data processing methods and the types of facilities necessary to utilize multispectral sensing data are dealt with, and applications of multispectral sensing are indicated. ESRO

**N74-32819** Saab-Scania, Linkoping (Sweden).

**PASSIVE MICROWAVE TECHNIQUES AND SPACELAB APPLICATIONS**

E. Ohlsson In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 34 p refs

Physics, material properties, and technology of passive microwave radiometry are discussed. Geoscientific requirements are dealt with and spacelab applications are indicated. ESRO

**N74-32820** Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).

**SIDE-LOOKING RADAR AND SPACELAB EARTH RESOURCES SURVEY APPLICATIONS**

S. R. Dauncey In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 24 p

The basic concept of real aperture side-looking radar (SLR) is introduced, including brief comments on the processing required, leading to the concept of synthetic aperture radar. Handling of SLR data is discussed and spaceborne applications are indicated. Earth science applications of SLR are dealt with. ESRO

**N74-32828** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

**EARTH RESOURCES PAYLOADS FOR THE SPACELAB**

D. Davidts In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 28 p

A European earth resources payload for spacelab is detailed. The payload definition procedure, including feedback process, user requirements, spacelab missions, and mission analysis, is discussed. Shuttle/spacelab system capabilities are dealt with, notably a turnaround and mission model. The earth observation payload, involving payload elements and payload accommodation, is discussed. ESRO

**N74-32845** Israel Program for Scientific Translations, Ltd., Jerusalem.

**SOME RESULTS OF AIRCRAFT MEASUREMENTS OF RADIANT FLUXES AT DIFFERENT TROPOSPHERIC LEVELS**



V. L. Gaevskii, E. P. Barashkova, and L. I. Prokofeva *In its Atmospheric Radiation Studies* (TT-74-50010) 1974 p 93-106 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Aircraft measurements are reported of radiant fluxes (total and reflected radiation and upward long-wave radiation), carried out during 1968 to 1969 in Western Kazakhstan and parts of adjoining European U.S.S.R. over fixed sections with different types of underlying surface (sea, desert, steppe, forest). These measurements made it possible to estimate the absolute values of the radiant flux at different altitudes in the troposphere and their seasonal variability over different kinds of underlying surface. Author

**N74-32848** Israel Program for Scientific Translations, Ltd., Jerusalem.

**AIRBORNE MEASUREMENT OF SPECTRAL REFLECTION**  
V. I. Korzov and L. B. Krasilshchikov *In its Atmospheric Radiation Studies* (TT-74-50010) 1974 p 176-179 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

An airborne method is examined of measuring curves of absolute spectral luminance coefficients of the underlying surface, based on measurements of relative curves of luminance and albedo.

Author

**N74-32853** Israel Program for Scientific Translations, Ltd., Jerusalem.

**AIRBORNE INSTRUMENTS FOR MEASURING REFLECTION: THE SPECTRAL INDICATOMETER**  
V. I. Korzov and L. B. Krasilshchikov *In its Atmospheric Radiation Studies* (TT-74-50010) 1974 p 197-202 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

A description is given of a two channel instrument for measuring the relative curves of surface luminance in 10 spectral regions, separated by interference filters, in the 0.5 to 2.5 micron region. Author

**N74-32870#** Utah State Univ., Logan. Electro-Dynamics Lab.

**AIRCRAFT INFRARED MEASUREMENTS Final Report, 1 Oct. 1970 - 30 Nov. 1973**

Ronald J. Huppi and Doran J. Baker 31 Jan. 1974 35 p (Contract F19628-71-C-0059)

(AD-781794; AFCRL-TR-74-0108) Avail: NTIS CSCL 04/1  
Infrared measurements of auroral, airglow and artificial source emissions were planned and performed. The measurements were made with a near infrared (NIR) radiometer system and a cold chopper interferometer-radiometer system operating from an AFCRL KC-135 aircraft. Some support measurements were also performed from a ground-based station. These measurements were necessary for rocket support and future aircraft-borne measurement planning and correlation. To accomplish the desired measurements, it was necessary to periodically perform calibrations, inspections, and maintenance on the instrument systems. Optional modifications were designed and constructed for the NIR system to allow measurements of target sources in bright backgrounds and to allow narrow field of view measurements. In addition, a radiometer was designed and constructed to make infrared measurements at wavelengths from 2.9 to 4.9 micrometers. Finally, a design study of a radiometer for wavelength measurements from 1.4 to 4.9 micrometers was performed. (Modified author abstract) GRA

**N74-32893#** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**ANALYSIS OF MULTISPECTRAL SIGNATURES AND INVESTIGATION OF MULTI-ASPECT REMOTE SENSING**

**TECHNIQUES Technical Report, 1 Feb. - 31 Oct. 1973**

W. A. Malila, R. H. Hieber, and J. E. Sarno Jul. 1974 114 p refs

(Contract NAS9-9784)

(NASA-CR-140201; ERIM-190100-27-T)

Avail: NTIS

HC \$8.75 CSCL 14E

Two major aspects of remote sensing with multispectral scanners (MSS) are investigated. The first, multispectral signature analysis, includes the effects on classification performance of systematic variations found in the average signals received from various ground covers as well as the prediction of these variations with theoretical models of physical processes. The foremost effects studied are those associated with the time of day airborne MSS data are collected. Six data collection runs made over the same flight line in a period of five hours are analyzed, it is found that the time span significantly affects classification performance. Variations associated with scan angle also are studied. The second major topic of discussion is multi-aspect remote sensing, a new concept in remote sensing with scanners. Here, data are collected on multiple passes by a scanner that can be tilted to scan forward of the aircraft at different angles on different passes. The use of such spatially registered data to achieve improved classification of agricultural scenes is investigated and found promising. Also considered are the possibilities of extracting from multi-aspect data, information on the condition of corn canopies and the stand characteristics of forests. Author

**N74-32939#** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**APPLICATIONS OF TUNABLE HIGH ENERGY/PRESSURE PULSED LASERS TO ATMOSPHERIC TRANSMISSION AND REMOTE SENSING**

R. V. Hess and R. K. Seals Sep. 1974 17 p refs

(NASA-TM-X-72010) Avail: NTIS HC \$3.00 CSCL 20E

Atmospheric transmission of high energy C12 O2(16) lasers were improved by pulsed high pressure operation which, due to pressure broadening of laser lines, permits tuning the laser 'off' atmospheric C12 O2(16) absorption lines. Pronounced improvement is shown for horizontal transmission at altitudes above several kilometers, and for vertical transmission through the entire atmosphere. The atmospheric transmission of tuned C12 O2(16) lasers compares favorably with C12 O2(18) isotope lasers and CO lasers. The advantages of tunable, high energy, high pressure pulsed lasers over tunable diode lasers and waveguide lasers, in combining high energies with a large tuning range, are evaluated for certain applications to remote sensing of atmospheric constituents and pollutants. Pulsed operation considerably increases the signal to noise ratio without seriously affecting

**N74-33079** Israel Program for Scientific Translations, Ltd., Jerusalem.

**SPECTROMETRIC METHOD OF MEASURING THE CONCENTRATION OF NATURAL RADIOACTIVE AEROSOLS**

V. G. Labushkin, V. I. Popov, and L. S. Ruzer *In its Nucl. Meteorol.* (TT-74-50011) 1974 p 297-309 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969.

CSCL 18H

A spectrometric method is discussed for determining the concentration of natural atmospheric radioactive aerosols formed by radon and thoron decay daughter products. The determination of radon daughter product concentrations is accompanied by measurement of the alpha and beta activity of the disperse phase of aerosols deposited on a fine fibred LFS-1 filter by means of scintillation spectrometric detection units. For a simultaneous measurement of the concentration of daughter products of both radon and thoron, a spectrometric unit for the detection of alpha radiation, composed of a 0.3 to 0.4 mm thick CsI(Tl) crystal of 63 mm diameter and a FEU-52 photomultiplier is used. It is demonstrated that the adoption of these spectroscopic methods considerably reduces the error and facilitates determination of the self-absorption of alpha radiation in the aerosol sample and the dust content of the air. Author

## 08 INSTRUMENTATION AND SENSORS

**N74-33351** Oxford Univ. (England). Dept. of Physics.

### REMOTE SOUNDING. INTRODUCTION

J. T. Houghton / In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 15 p refs

Remote sounding of the earth atmosphere is discussed. Visible and infrared imagery is briefly dealt with and a formula for the atmosphere's radiation budget is given. Sounding of the global atmospheric temperature field is dealt with in detail. ESRO

**N74-33353** Science Research Council, Slough (England).

### LASER SOUNDING EXPERIMENTS

L. Thomas / In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 25 p refs

The use of laser radar for determination of atmospheric structure and composition is discussed. Laser radar principles are laid down and types of scattering processes are dealt with. A threshold condition for laser action is discussed and atmospheric transmission is dealt with. Several types of atmospheric investigation with laser sounding experiments are indicated, both for regions above and for regions below 40-50 km. ESRO

**N74-33354** European Space Research Organization, Paris (France).

### REPORT ON DISCUSSIONS ON SPACELAB PAYLOADS FOR ATMOSPHERIC RESEARCH

In its The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 17 p

The use of spacelab for atmospheric research was presented by scientists from different disciplines. Discussions on their viewpoints are detailed. ESRO

**N74-33821\*** Boeing Co., Kent, Wash.

### QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Aug. 1974

David L. Tingey, Principal Investigator Aug. 1974 1 p EREP (Contract NAS9-13303)

**N74-33834\*** Servicio Geologico de Bolivia, La Paz.

### BOLIVIAN PARTICIPATION IN THE INVESTIGATION AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP)

Carlos E. Brockmann, Principal Investigator Sep. 1973 4 p Sponsored by NASA EREP (E74-10767; NASA-CR-140015) Avail: NTIS HC \$4.00 CSCL 05B

**N74-33863\*** Illinois Univ., Urbana. Dept. of Electrical Engineering.

### INVESTIGATIONS OF THE IONOSPHERE BY SPACE TECHNIQUES

S. A. Bowhill [1974] 18 p refs

(Grant NGR-07-004-109)

(NASA-CR-140039) Avail: NTIS HC \$4.00 CSCL 04A

Much of the impetus to ionosphere research since the International Geophysical Year has come from new types of measurement using space vehicles. The key developments are outlined, together with the contributions that they have made to the understanding of the ionosphere. Author

**N74-33908\*** European Space Research Organization, Paris (France).

### EARTH RESOURCES AIRCRAFT FACILITY. VOLUME 1:

### SUMMARY

F. Carnec et al Apr. 1974 91 p refs Transl. into ENGLISH of Earth Resources Aircraft Facility Vol. 1 Sommaire de l'Etude Rapport Final, ESRO-CR(P)-117, Soc. d'Etudes Tech. et d'Entreprises Gen., 1972

(ESRO-TT-46; ESRO-CR(P)-117) Avail: NTIS HC \$7.75

Results on mission planning for a European earth resources survey aircraft are summarized. They include choice of mission, analysis of payload, choice of aircraft, technical feasibility, initial operational program, and juridical aspects of the Earth Resources Aircraft Facility project. ESRO

**N74-33987\*** Thermo-Systems, Inc., St. Paul, Minn.

### STATE OF THE ART: 1971 INSTRUMENTATION FOR MEASUREMENT OF PARTICULATE EMISSIONS FROM COMBUSTION SOURCES. VOLUME 4: EXPERIMENTS Final Report

Gilmore J. Sem and John A. Borgos Sep. 1973 123 p refs (Contract EPA-CPA-70-23)

(PB-231919/2; EPA-650/2-73-022) Avail: NTIS HC \$9.25 CSCL 14B

The second phase was an experimental evaluation of the most promising technique: beta radiation attenuation. Section 2 describes early laboratory tests performed with the sensing head of a Gelman beta radiation instrument. Section 3 describes a sampling facility, designed specifically for the evaluation of the instruments which measure particle mass concentration of stack effluent. Section 4 describes results of the calibration of the sampling facilities in the field experiment station under several normal operating conditions. Section 5 describes tests of two prototype instruments with beta radiation particle mass sensors. The highly encouraging measurements indicate that the beta radiation sensing with filter collection of particles is a strong candidate for the measurement of particle mass concentration in smoke stacks. Section 6 presents candid comments regarding the state-of-the-art of commercial transmissometers in January 1971. GRA

**N74-34752\*** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

### DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193 Monthly Letter Progress Report No. 12, Aug. 1974

Richard K. Moore, Fawwaz T. Ulaby, Principal Investigators, Arun Sobti, John C. Barr, Evan Davison, Chia Sung, Saad Ulaby, and Tom Burton Aug. 1974 6 p EREP (Contract NAS9-13331)

(E74-10785; NASA-CR-140138) Avail: NTIS HC \$4.00 CSCL 14B

**N74-34789\*** Massachusetts Inst. of Tech., Cambridge. Center for Space Research.

### FEASIBILITY STUDY OF A SWEEP FREQUENCY ELECTROMAGNETIC PROBE (SWEEP) USING INDUCTIVE COUPLING FOR THE DETERMINATION OF SUBSURFACE CONDUCTIVITY OF THE EARTH AND WATER PROSPECTING IN ARID REGIONS

Gerald A. LaTorraca and Lawrence H. Bannister Sep. 1974 111 p refs

(Grants NGL-22-001-019; AID/csd-3360)

(NASA-TM-X-70383; CSR-TR-74-3) Avail: NTIS HC \$8.75

Techniques developed for electromagnetic probing of the lunar interior, and techniques developed for the generation of high power audio frequencies were combined to make practical a magnetic inductive coupling system for the rapid measurement of ground conductivity profiles which are helpful when prospecting for the presence and quality of subsurface water. A system which involves the measurement of the direction, intensity, and time phase of the magnetic field observed near the surface of the earth at a distance from a horizontal coil energized so as to create a field that penetrates the earth was designed and studied to deduce the conductivity and stratification of the subsurface.

Theoretical studies and a rudimentary experiment in an arid region showed that the approach is conceptually valid and that this geophysical prospecting technique can be developed for the economical exploration of subterranean water resources. Author

as a result of the third visit to Skylab involve the advancement of the sciences, practical applications, the durability of man and systems in space, and spaceflight effectiveness and economy.

A.A.D.

**N74-34802** Joint Publications Research Service, Arlington, Va.  
**DEVELOPMENT OF GRAVIMETRY AND THE THEORY OF  
 FIGURE OF THE EARTH**

B. P. Shimbirev and P. F. Shokin *In its* Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 70-83 refs  
 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 49-57

Detailed information concerning the structure of the earth's gravity field and its change with time is needed to solve problems in studies on: (1) circumterrestrial space; (2) precise determination of the relative position of individual points on the earth's surface; (3) the internal structure, distribution and dynamics of the earth's mass; as well as (4) in observation on satellite motions. G.G.

**N74-34804** Joint Publications Research Service, Arlington, Va.  
**PHOTOGRAPHIC EXPERIMENTS DURING MULTIDAY  
 SPACESHIP FLIGHT** c14

V. I. Sevastyanov *In its* Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 97-100 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 69-71

Photographic and spectrophotometric observations aboard Soyus 9 spacecraft are outlined. The overall purpose was a study of the earth's surface and atmosphere with applications to geological prospecting, long range meteorological forecasting, and aerial surveying of land use and urban development. G.G.

**N74-34826#** Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).  
**SIDE-LOOKING RADAR SYSTEMS AND THEIR POTENTIAL  
 APPLICATION TO EARTH-RESOURCES SURVEYS:  
 SUMMARY VOLUME**

K. Grant et al Paris ESRO Mar. 1973 151 p  
 (Contract ESTEC-1537/71)

(ESRO-CR-141) Avail: NTIS HC \$10.75

The results of a 9-month study on side looking radar (SLR) systems and their potential application to earth resources surveys are summarized. Information is provided on the basic physics and technology of SLR, radar scattering from natural surfaces, potential applications in the earth sciences, and the processing of SLR data. From this background, recommendations are provided on a European program for the development, evaluation, and application of SLR, considering both aircraft and satellite platforms. Author (ESRO)

**N74-35239\*#** National Aeronautics and Space Administration.  
 Lyndon B. Johnson Space Center, Houston, Tex.

**SKYLAB MISSION REPORT, THIRD VISIT**

Jul. 1974 337 p refs

(NASA-TM-X-70385; JSC-08963) Avail: NTIS HC \$20.00 CSCL 22C

An evaluation is presented of the operational and engineering aspects of the third Skylab visit, including information on the performance of the command and service module and the experiment hardware, the crew's evaluation of the visit, and other visit-related areas of interest such as biomedical observations. The specific areas discussed are contained in the following: (1) solar physics and astrophysics investigations; (2) Comet Kohoutek experiments; (3) medical experiments; (4) earth observations, including data for the multispectral photographic facility, the earth terrain camera, and the microwave radiometer/scatterometer and altimeter; (5) engineering and technology experiments; (6) food and medical operational equipment; (7) hardware and experiment anomalies; and (8) mission support, mission objectives, flight planning, and launch phase summary. Conclusions discussed

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Includes economic analysis.

**A74-38988** Survey of earth resources technology and scientific objectives. N. Takagi (Nihon University, Tokyo, Japan). In: Orbital international laboratory. Tarzana, Calif., American Astronautical Society, 1974, p. 223-236.

Review of several examples of the research performed in Japan in the fields of forestry, oceanography, meteorology, hydrology, geothermal resources, air pollution, and remote sensing. Specific examples of such research discussed include studies of winter monsoon snowstorms, surface temperature distribution around Mt. Fuji, air-pollution caused plant debilitation observed by infrared photogrammetry, earthquake observation, tsunami-warning, volcano activity and ocean environment monitoring. M.V.E.

**A74-39276** Approaches to earth survey problems through use of space techniques; Proceedings of the Symposium, Konstanz, West Germany, May 23-25, 1973. Symposium sponsored by COSPAR and Deutsche Forschungsgemeinschaft. Edited by P. Bock (Connecticut, University, Storrs, Conn.). Berlin, East Germany, Akademie-Verlag GmbH, 1974. 479 p.

Reports on the use of remote sensing techniques for geography, earth surveying, land use mapping, oceanography, atmospheric and climatological studies, and meteorology are presented. Some of the topics covered include: remote sensing in the study of Antarctic marine resources and vertebrates, earth satellite measurements as applied to sea ice problems, use of ERTS 1 satellite in remote sensing of water resources in Canada, ERTS imagery for study of snow and glacier hydrology, a low-cost system for reproducing ERTS imagery, need for and aspects of a cooperative European earth resources program, and optical investigations from the manned spacecraft Voskhod 2.

P.T.H.

**A74-39651** International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. Conference sponsored by the Institute of Electrical and Electronics Engineers, New York, Institute of Electrical and Electronics Engineers, Inc. (ICC Conference Record, Volume 10), 1974. 975 p. Members, \$20.; nonmembers, \$30.

Topics discussed include nonlinear circuits in communications, digital and analog microwave communication, control of digital communication systems, communication electronics, advances in voiceband data transmission, remotely piloted vehicle communication systems, switching systems, microwave line-of-sight propagation problems, speech coding and processing, communication satellites, fiber optics for transmission, digital processing in telecommunications, data communication systems design considerations, coding and error control, radio communications, equalizers in data communications systems, electromagnetic compatibility and the communication spectrum, VLF to EHF radio communications, maritime satellite progress, detection and signal processing, PCM and analog transmission, the Earth Resources Technology Satellite, intersystem

interference coordination in the microwave bands, digital communication techniques, synchronization in digital satellite communications, and communication systems theory.

Individual items are announced in this issue.

A.B.K.

**A74-39705 \*** Recent advancements in information extraction methodology and hardware for earth resources survey systems. J. D. Erickson and F. J. Thomson (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 32B-1 to 32B-8. 8 refs. Contracts No. NAS5-21783; No. NAS1-11979; No. NAS9-9784; Grants No. NGR-23-005-552; No. DAAK02-73-C-0438.

The present work discusses some recent developments in preprocessing and extractive processing techniques and hardware and in user applications model development for earth resources survey systems. The Multivariate Interactive Digital Analysis System (MIDAS) is currently being developed, and is an attempt to solve the problem of real time multispectral data processing in an operational system. The main features and design philosophy of this system are described. Examples of wetlands mapping and land resource inventory are presented. A user model developed for predicting the yearly production of mallard ducks from remote sensing and ancillary data is described. P.T.H.

**A74-39718** Interdisciplinary analysis and interpretations of Earth Resources Technology Satellite /ERTS/ data. G. J. McMurtry (Pennsylvania State University, University Park, Pa.). In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 38B-1 to 38B-3.

The objectives of this work have been to ascertain the usefulness of ERTS data in the areas of natural resources and land use inventory, geology and hydrology, and environmental quality. Specific results include a study in land use, discrimination between types of forest resources and vegetation, detection of previously unknown geologic faults and correlation of these with known mineral deposits and ground water, mapping of mine spoils in the anthracite region of eastern Pennsylvania, mapping of strip mines and acid mine drainage in central Pennsylvania, agricultural land use mapping, and detection of gypsy moth infestation. Both manual photointerpretive techniques and automatic computer processing methods have been developed and used, separately and in a combined approach. (Author)

**A74-40977 #** Argentine report to COSPAR. COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 15 p.

**A74-40978 #** Indian National Committee for Space Research report to COSPAR. COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 51 p. 105 refs.

The principal objectives of the space program in India, as defined by the Indian National Committee for Space Research, are: (1) to develop indigenous competence for designing and building hardware involved in space technology, including rockets and satellites for scientific research and practical applications; (2) to use these systems for providing point-to-point communication and a national television hook-up through a direct broadcast synchronous satellite; and (3) to develop the use of satellites for meteorology and remote sensing of earth resources. The organization and facilities of the Indian space effort are outlined, and the results of significant experiments are summarized, including studies of the neutral upper atmosphere, the ionosphere, the earth's magnetic field and the

## 09 GENERAL

magnetosphere, and research in cosmic rays and astrophysics, X-ray and gamma-ray astronomy, radio astronomy, and study of lunar samples and meteorites. The goals and development of the Satellite Instructional Television Experiment are sketched, and work carried out in remote sensing of natural resources is briefly described. P.T.H.

**A74-40979 #** The National Committee for Space Research of The Israel Academy of Sciences and Humanities - Report to COSPAR on Space Activities 1973-1974. *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 7 p.*

**A74-40980** French Space Program report to COSPAR (Programme Spatial Français rapport au COSPAR). *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 134 p. 378 refs. In French.*

Review of the organization structure, facilities and resources, programs and goals, and future trends of space research in France. Discussed areas of study include: (1) extrasolar stellar and planetary physics, cosmic radiation, galactic and extragalactic UV and IR as well as radio and visible-spectrum astronomies; (2) solar physics; (3) moon and planet studies; (4) ionosphere and magnetosphere physics; (5) aeronomy and upper atmosphere physics; (6) meteorology, space- and ground-based, as well as digital-simulation aided studies of meteorology dynamics; (7) oceanology and atmosphere-ocean interaction studies; (8) geodesy and geodynamics; (9) ground-, air-, and space-based studies of earth resources; and (10) space biology.

M.V.E.

**A74-40984 #** Space research in the Republic of South Africa. *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 13 p. 28 refs.*

**A74-40986 #** Space activity in Austria 1973/74. *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 25 p. 33 refs.*

**A74-40987 #** National report on space research and activities in Indonesia. *COSPAR, Plenary Meeting, 17th, São Paulo, Brazil, June 17-July 1, 1974, Paper. 7 p.*

**A74-42073 \* #** Visual observations from space. W. B. Lenoir, J. L. Kaltenbach, M. C. McEwen, R. A. Weitenhagen, and V. R. Wilmarth (NASA, Johnson Space Center, Houston, Tex.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-124. 20 p. 12 refs.*

A visual observations project was established as part of the Skylab experimental program in order to optimize the collection of scientific data during the 84-day Skylab 4 mission. One objective of this project was the determination of the capabilities of the crewmen in the visual identification of various types of surface, air, and water phenomena of the earth which may be observed from the Skylab orbit. Another objective was a study of the possibilities provided by visual observations, supplemented by photographs, in the support of scientific investigations. Aspects of premission preparations are considered along with details concerning the equipment to be used and questions of mission operations. The results of the project show that the presence of man in an earth-observations program contributes a significant additional capability which is not available with a totally automated program.

G.R.

**A74-42095 \* #** Operational aspects of Skylab Student Project experiments. J. B. MacLeod (NASA, Johnson Space Center, Space Shuttle Program Office, Houston, Tex.). *American Astronautical Society, Annual Meeting, 20th, Los Angeles, Calif., Aug. 20-22, 1974, Paper 74-153. 16 p.*

The activities associated with the operational aspects of the Skylab Student Project experiments began with the participation of flight operations personnel on the National Science Teachers Association Selection Board and ended with the performance of the student experiments by the Skylab flightcrews. The operational criteria used during the compatibility analysis to determine which of the 25 national winners could be flown on board the Skylab vehicle are reviewed, the factors involved in the assignment of the experiments to Skylab missions are discussed, the activities associated with training the flightcrews in the operation of the student experiments are described, and the actual performance of the experiments during the mission and the associated ground operations in the Mission Control Center are detailed. (Author)

**A74-42352** International Symposium on Space Technology and Science, 10th, Tokyo, Japan, September 3-8, 1973, Proceedings. Symposium sponsored by the Science Council of Japan, et al. Tokyo, AGNE Publishing, Inc., 1973. 1306 p.

Topics include descriptions of the space programs of the participating countries, some developments in propellants and propulsion techniques, materials and structures, design analysis and testing, flight dynamics and astrodynamics, satellite theory, aerodynamic theory of flowfields and turbulences, the aerospace environment, thermal effects and particle-surface interactions, design of existing spacecraft, electronic components and devices, solar cells and arrays, communications and telemetry, satellite broadcasting systems, guidance and control systems, altitude control simulation, systems engineering including reliability and range operations, checkout systems, space science and projected missions and probes, balloon observations and equipment, space medicine and space biology, space law and space rescue, and many others.

J.K.K.

**A74-42472** The system concept of the German Space Operations Center. H. Sax (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Zentralabteilung Satellitenbetrieb, Oberpfaffenhofen, West Germany). In: International Symposium on Space Technology and Science, 10th, Tokyo, Japan, September 3-8, 1973, Proceedings. Tokyo, AGNE Publishing, Inc., 1973, p. 1135-1144.

During the past years, a ground and mission operations system consisting of a ground-station network for VHF telemetry, remote control, and tracking and for S-band telemetry and remote control, a control center for network and mission control, and data processing facilities has been built up in Germany. It is involved in mission operations for such different types of projects as earth-orbiting scientific satellites, geostationary communications satellites (Symphonie) and interplanetary space probes (Helios). The space missions to be controlled are described briefly, and their special operational requirements are shown. Following these, the system concept is developed, and a brief technical description of the ground facilities is given. (Author)

**A74-43601** Advancements in flight test engineering; Proceedings of the Fifth Annual Symposium, Anaheim, Calif., August 7-9, 1974. Symposium sponsored by the Society of Flight Test Engineers. Lancaster, Calif., Society of Flight Test Engineers, 1974. 398 p.

The development of short takeoff and landing (STOL) operational criteria, demonstration of the feasibility of a scanning beam microwave landing system, automatic avionics system checkout and monitoring in a flight test environment are among the topics covered in papers concerned with recent advances in flight test engineering. Other topics covered include automatic avionics system checkout and monitoring in a flight test environment, effective data monitoring during airplane flyover noise tests, and airborne testing of advanced multisensor aircraft.

M.V.E.

**A74-44688** Geo-stationary environmental satellites. M. Howard. *Spaceflight*, vol. 16, Oct. 1974, p. 383-387.

The geostationary operational environmental satellite system is to provide continuous day and night observation of the earth and its environment. Other objectives include the collection of data from remote observing platforms, broadcasts of environmental data to remote stations, and the measurement of energetic solar particle flux, X rays, and the geomagnetic field intensity. The characteristics of the synchronous meteorological satellite are discussed along with the communications system, questions of command and data acquisition, and satellite field service stations. A balloon experiment requiring satellite assistance is also considered. G.R.

**A74-45060** Advances in satellite meteorology. 2. Edited by N. K. Vinnichenko and A. G. Gorelik. (Translation of *Sputnikovaia Meteorologiya*, no. 103, Moscow, Gidrometeoizdat, 1972.) New York, Halsted Press; Jerusalem, Israel Program for Scientific Translations, 1974. 152 p. \$18.50.

Topics discussed concern the application of microwave radiometric methods to the determination of atmospheric moisture and the moisture content of clouds, and to the measurement of precipitation in the form of rain. The applications of microwave radiometry include the determination of total atmospheric moisture content, the spatial distribution of the brightness temperatures of clouds and rain, the identification of precipitation zones, the determination of rain intensities, the dependence of attenuation coefficients on rain intensity and drop size distribution, the determination of integrated water content, Cosmos 243 measurements of water vapor content over the oceans and of frontal cloudiness, measurements of atmospheric emission and cloud emissivity in the infrared range, statistical analysis of radar echoes, measurements of wind gradients in precipitation, and the determination of vertical currents in cumulus clouds and precipitation. A.B.K.

**A74-46251** Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-29, 1974, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1974. 686 p. \$90.

The topics considered are related to electronic calculators, imaging with charge transfer devices, the foreign thrust to capture U.S. markets, radio amateur space communication, automation in circuit testing, trends in computing costs, new international markets, optical communications, and data base systems. Other areas considered include microprocessor architectures, packaging concepts for solid state, switching systems control by minicomputer, new technology in telephones, the development of new end-use markets for electronics, advances in computer storage, microprocessor applications, the growth potential in new microwave semiconductors, and the earth and ocean physics application program. G.R.

**N74-29727\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. **THE FIRST EARTH RESOURCES TECHNOLOGY SATELLITE NEARLY TWO YEARS OF OPERATION** William Nordberg Jun. 1974 14 p refs Presented at the COSPAR Seminar on Space Appl. of Direct Interest to Developing Countries, Sao Paulo, Brazil (NASA-TM-X-70715; X-900-74-217) Avail: NTIS HC \$4.00 CSCL 22B

A brief status report on the performance of the ERTS-1, and an overview of the applications derived from the images are presented. The ERTS-1 spacecraft, sensor and picture processing systems have continued to perform almost flawlessly since August 1972. Registered, multispectral images of all major land masses of the earth, both polar and some oceanic regions

are continuously made, covering daily an area of about 5 million square kilometers. The systematic repetition of these observations, which were made over most parts of the world at least once every season, and the high accuracy of thematic mapping that can be obtained from the images, have resulted in many applications that have immense potential benefits for developing countries. Among these applications are the detection and accurate mensuration of surface water; the identification and mensuration of forests, rangeland, crops and soils; the monitoring and mapping of water quality, wildlife habitats and of the effects of land use practices on food and water resources; the assessment of flooding and earthquake hazards; and the facilitation of mineral exploration. Author

**N74-29732\*** Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.

**BASIC RESEARCH AND DATA ANALYSIS FOR THE NATIONAL GEODETIC SATELLITE PROGRAM AND FOR THE EARTH AND OCEAN PHYSICS APPLICATIONS PROGRAM** Semiannual Status Reports, Jan. - Jun. 1974 Jul. 1974 99 p refs

(Grants NGL-36-008-093; NGR-36-008-204; OSURF Proj. 2514; OSURF Proj. 3820-A1) (NASA-CR-139249; SASR-14; SASR-2) Avail: NTIS HC \$8.00 CSCL 08E

Activities related to the National Geodetic Satellite Program are reported and include a discussion of Ohio State University's OSU275 set of tracking station coordinates and transformation parameters, determination of network distortions, and plans for data acquisition and processing. The problems encountered in the development of the LAGEOS satellite are reported in an account of activities related to the Earth and Ocean Physics Applications Program. The LAGEOS problem involves transmission and reception of the laser pulse designed to make accurate determinations of the earth's crustal and rotational motions. Pulse motion, ephemeris, arc range measurements, and accuracy estimates are discussed in view of the problem. Personnel involved in the two programs are also listed, along with travel activities and reports published to date. A.A.D.

**N74-29733\*** Arizona Univ., Tucson. Office of Arid Lands Studies.

**APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG) Annual Report**

Kenneth E. Foster and Jack D. Johnson Apr. 1974 113 p refs Original contains color illustrations (Grant NGL-03-002-313)

(NASA-CR-139315; AR-2; OALS-Bull-7) Avail: NTIS HC \$8.75 CSCL 08B

Progress of ARSIG projects is reported and the impact of the projects upon policy decision within Arizona is discussed. E.J.O.

**N74-30682\*** Army Engineer District, San Francisco, Calif. Geoscience Div.

**CALIFORNIA COAST NEARSHORE PROCESSES STUDY Final Report, Aug. 1972 - May 1974**

Douglas M. Pirie and David D. Steller, Principal Investigators May 1974 168 p refs Prepared in cooperation with Geosource, Intern., Inc. Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(NASA Order S-70257-AG) (E74-10692; NASA-CR-139225) Avail: NTIS HC \$11.50 CSCL 08C

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**N74-30688\*** Maine Dept. of Transportation, Augusta.  
**MULTIDISCIPLINARY ANALYSIS FOR HIGHWAY ENGINEERING PURPOSES Progress Report**  
Ernest G. Stoeckeler, Raymond G. Woodman, and Robert S. Farrell, Principal Investigators 6 Aug. 1974 9 p EREP  
(Contract NAS9-13359)  
(E74-10699; NASA-CR-139318; PR-3) Avail: NTIS  
HC \$4.00 CSCL 08B

**N74-30699#** Tohoku Univ., Sendai (Japan).  
**THE SCIENCE REPORTS OF THE TOHOKU UNIVERSITY. SERIES 5: GEOPHYSICS, VOLUME 21, NO. 3**  
Sep. 1973 34 p refs  
Avail: NTIS HC \$4.75  
Geomagnetic surveys of volcanoes and twilight observations of D lines are reported.

**N74-30705\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**THIRD EARTH RESOURCES TECHNOLOGY SATELLITE-1 SYMPOSIUM. VOLUME 1: TECHNICAL PRESENTATIONS. SECTION A**  
Stanley C. Freden, comp., Enrico P. Mercanti, comp., and Margaret A. Becker, comp. Washington 1974 992 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973  
(NASA-SP-351-Vol-1-Sect-A) Avail: NTIS MF \$1.45; SOD HC \$16.80 per set of sections A and B CSCL 05B

Papers presented at the *Third Symposium on Significant Results Obtained from the first Earth Resources Technology Satellite* covered the areas of: agriculture, forestry, range resources, land use, mapping, mineral resources, geological structure, landform surveys, water resources, marine resources, environment surveys, and interpretation techniques.

**N74-30706\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**ERTS-1 SYSTEM PERFORMANCE OVERVIEW**  
John H. Boeckel In *its* 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 1-12  
CSCL 22C

The ERTS-1 spacecraft had a life of one year as a design goal. At the end of one year, the spacecraft was still providing about 130 scenes per day in multispectral images having resolution and radiometric accuracy better than prelaunch predictions.

Author

**N74-30707\*** Canadian Center for Remote Sensing, Ottawa (Ontario).  
**CANADIAN ERTS PROGRAM PROGRESS REPORT**  
L. W. Morley and A. K. McQuillan In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 13-19 refs  
CSCL 05B

Progress of the Canadian ERTS program is provided along with statistics on the production and role of ERTS images both from the CCRS in Ottawa and from the Prince Albert Saskatchewan satellite station. The types of products, difficulties of production and some of the main applications in Canada are discussed.

Author

**N74-30749\*** Geological Survey, Menlo Park, Calif.  
**ANALYSIS OF STATE OF VEHICULAR SCARS ON ARCTIC TUNDRA, ALASKA**

Ernest H. Lathram In NASA. Goddard Space Flight Center 3d ERTS-1 Symp., Vol. 1, Sect. A 1974 p 633-641 refs

(Paper-G3) CSCL 08L

Identification on ERTS images of severe vehicular scars in the northern Alaska tundra suggests that, if such scars are of an intensity or have spread to a dimension such that they can be resolved by ERTS sensors (20 meters), they can be identified and their state monitored by the use of ERTS images. Field review of the state of vehicular scars in the Umiat area indicates that all are revegetating at varying rates and are approaching a stable state.

Author

**N74-30774\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**THIRD EARTH RESOURCES TECHNOLOGY SATELLITE-1 SYMPOSIUM. VOLUME 1: TECHNICAL PRESENTATIONS. SECTION B**  
Stanley C. Freden, comp., Enrico P. Mercanti, comp., and Margaret A. Becker, comp. Washington 1974 936 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973  
(NASA-SP-351-Vol-1-Sect-B) Avail: NTIS MF \$1.45; SOD HC \$16.80 per set of sections A and B CSCL 05B

**N74-31390** British Library Lending Div., Boston Spa (England).  
**THE PROBLEMS OF EFFICIENT UTILIZATION OF NATURAL RESOURCES**

V. Prokudin [1974] 5 p refs Transl. into ENGLISH from Econ. Gazeta (USSR), no. 44, 1973  
(BLL-M-23272-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Problems of environmental protection are briefly discussed. An integrated program is presented for the development of a general and comprehensive program of cooperation in the field of environment protection and the efficient utilization of natural resources.

M.C.F.

**N74-31409#** Mitre Corp., McLean, Va.  
**SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 1: INTRODUCTORY AND CONTEXT SESSIONS**  
Nov. 1972 280 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.  
(PB-219953/7; MITRE-72-190-Vol-1) Avail: NTIS HC \$6.75; HC also available from NTIS \$34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of the first two sessions of the Symposium on Energy, Resources, and the Environment sponsored by the MITRE Corporation, Washington, D.C., the Institute of Energy Economics, Tokyo, Japan, and the Nomura Research Institute of Technology and Economics, Tokyo, Japan on July 9th, 10th, 11th, and 12th, 1972. Topics discussed include: Alternative world futures; Review of MITRE study; Long-range prospects for mankind; International economic implications of the nuclear fuel cycle; Japanese energy perspective; U.S. short and medium term issues; Pacific basin development and future; International context.

GRA

**N74-31410#** Mitre Corp., McLean, Va.  
**SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 2: PANEL SESSIONS ON ENERGY AND RESOURCE ISSUES**  
Nov. 1972 502 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.  
(PB-219954/5; MITRE-72-190-Vol-2) Avail: NTIS HC \$12.50; HC also available from NTIS \$34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of two



of the four workshop sessions held on July 11th at the Symposium on Energy, Resources, and the Environment held on July 9th, 10th, 11th, and 12th, 1972. The session on Energy Issues featured presentations on The Development of Fusion in Japan and its Prospects, The Multi-Utilization of Nuclear Energy - A Techno-Economical Evaluation of a Process for Large Steel Making, The Present Status and Future Prospects of Energy Utilization in the Iron Industry, Magneto-Hydrodynamic (MHD) Power Generation Status and Prospects for Electric Utility Application, Large Scale Utilization of Solar Energy, and Geothermal Energy. The session devoted to Resource Issues featured presentations on Resource Development as a Function of Japanese Economic Growth, Australian Energy Resources, Indonesian Energy Resources, U.S. Transportation: Some Energy and Environmental Considerations, Urban Transportation, and Uranium Enrichment With a Sea-Thermal Power Plant. GRA

**N74-31411#** Mitre Corp., McLean, Va.  
**SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 3: PANEL SESSIONS ON ENVIRONMENTAL, ECONOMICAL AND INSTITUTIONAL ISSUES**

Nov. 1972 462 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.  
 (PB-219955/2; MITRE-72-190-Vol-3) Avail: NTIS HC \$10.60; HC also available from NTIS \$34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of two of the four workshop sessions held on July 11th at the Symposium on Energy, Resources, and the Environment held on July 9th, 10th, 11th, and 12th, 1972. The session on Environmental Issues featured presentations on Environmental Action Around the World, Climate Change and the Influence of Man's Activities on the Global Environment, Approaches to Canadian Environmental Problems, Assessment of the Industrial EcoSystem and Industrial Policy in Japan, Some Problems Arising out of the Low Sulfur Fuel Supply System in Japan, Coal: The Black Magic, and Environmentally Acceptable Fuels by Today's Technology (With Emphasis on Gasification). The session on Institutional and Economic Issues included Some Comments on U.S. Energy Institutions, Technology Assessment of Mass Energy Consumption, An Idea and Concept of Japan's Policy on Natural Resources Development, Indonesian Institutional and Economic Issues, and The State of Our Mineral Resources. GRA

**N74-31412#** Mitre Corp., McLean, Va.  
**SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. VOLUME 4: RECAPITULATION OF ENERGY, RESOURCE, ENVIRONMENTAL, ECONOMIC AND INSTITUTIONAL ISSUES**

Nov. 1972 223 p refs Symp. held at Kyoto, Japan, 9-12 Jul. 1972 4 Vol.  
 (PB-219956/0; MITRE-72-190-Vol-4) Avail: NTIS HC \$6.75; HC also available from NTIS \$34.00/set of 4 reports as PB-219952-SET CSCL 13B

The report provides a transcript of the proceedings of the fourth day of the Symposium on Energy, Resources, and the Environment sponsored by The MITRE Corporation, Washington, D.C., the Institute of Energy Economics, Tokyo, Japan, and the Nomura Research Institute of Technology and Economics, Tokyo, Japan. The session was devoted to reports by the four Workshop Chairmen summarizing the issues discussed during the Energy Issues, Environmental Issues, Resource Issues, and Institutional and Economic Issues sessions. GRA

**N74-31784** Department of Energy, Mines and Resources, Ottawa (Ontario).

**RECORD OF OBSERVATIONS AT VICTORIA MAGNETIC OBSERVATORY, 1972** Publications of the Earth Physics Branch, Vol. 44, No. 13

P. R. Auld and C. W. Walker 1974 56 p refs

Copyright. Avail: Issuing Activity

Declination, inclination; and total magnetic force-

measurements were used to compute horizontal and vertical components. A summary of annual mean values for 1971.5 to 1972.5 shows a declination increase of 2.8 minutes, a 15 gamma increase in horizontal intensity, and a 14 gamma decrease in the vertical component. Author

**N74-31793\*#** Geological Survey, Reston, Va. Geographic Applications Program.

**CENTRAL ATLANTIC REGIONAL ECOLOGICAL TEST SITE (CARETS): A PROTOTYPE REGIONAL ENVIRONMENTAL INFORMATION SYSTEM** Progress Report, 1 Sep. - 31 Oct. 1973

Robert H. Alexander, Principal Investigator 1 Nov. 1973 24 p ERTS

(NASA Order S-70243-AG-3)

(E74-10712; NASA-CR-139545) Avail: NTIS HC \$4.25 CSCL 05B

**N74-31863#** Environmental Protection Agency, Washington, D.C. Office of Research and Development.

**DIRECTORY OF STATE AGENCIES ENGAGED IN ENVIRONMENTAL MONITORING**

Dec. 1973 88 p

Avail: NTIS HC \$7.50

A catalogue of the professional personnel at the state level who are responsible for environmental control and monitoring programs in the areas of air and water quality, water supply, solid waste management, pesticides, radiation, and noise is presented. The listings, which are made by state, include the name of the state health officer and other program heads with pertinent addresses, telephone numbers, and office hours.

Author

**N74-31865\*#** National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

**OZONE MEASUREMENT SYSTEMS IMPROVEMENTS STUDIES**

Robert W. Thomas, Keith Guard, Alfred C. Holland, and John F. Spurling Washington Aug. 1974 97 p refs Prepared in part by Wolf Research and Development Corp., Riverdale, Md. (Contract NAS6-2173)

(NASA-TN-D-7758) Avail: NTIS HC \$4.00 CSCL 04A

Results are summarized of an initial study of techniques for measuring atmospheric ozone, carried out as the first phase of a program to improve ozone measurement techniques. The study concentrated on two measurement systems, the electro chemical cell (ECC) ozonesonde and the Dobson ozone spectrophotometer, and consisted of two tasks. The first task consisted of error modeling and system error analysis of the two measurement systems. Under the second task a Monte-Carlo model of the Dobson ozone measurement technique was developed and programmed for computer operation. Author

**N74-32069#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

**A SONIC ANEMO-THERMOMETER FOR MEASURING VERTICAL FLUXES OF SENSIBLE HEAT IN THE ATMOSPHERIC BOUNDARY LAYER [DAS ULTRASCHALL-ANEMO-THERMOMETER ALS MESSGERAET FUER DEN VERTIKALEN FLUSS FUEHLBARER WAERME IN DER BODENNAHEN LUFTSCHICHT]**

Josef Lidl and Heinz Loebel 17 Jan. 1974 55 p refs In GERMAN; ENGLISH summary

(DLR-Mitt-74-07) Avail: NTIS HC \$5.75; DFVLR, Porz, West Ger. 17.30 DM

An instrument designed and developed for measurements of the turbulent fluxes of sensible heat in the atmospheric boundary layer is described. Measurements were carried out and results

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were obtained during long-time intervals for different weather conditions and seasons. The basic principle of the so-called sonic anemo-thermometer is the determination of the turbulent fluctuations of air temperature and vertical component of wind. A computer module in the equipment generates an output voltage proportional to the turbulent heat flux. The recording of the fluctuations and the time averages of heat flux is possible by analog as well as by digital recorder. An external digital computer may be used for signal processing and for plotting the mean values of preselected time intervals. Author (ESRO)

**N74-32778\*#** Servicio Geologico de Bolivia, La Paz.  
**BOLIVIAN PARTICIPATION IN THE INVESTIGATION AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP Progress Report, Sep. - Dec. 1973**

Carlos E. Brockmann, Principal Investigator Dec. 1973 4 p  
Sponsored by NASA EREP  
(E74-10752; NASA-CR-139992) Avail: NTIS HC \$4.00 CSCL 05B

**N74-32779\*#** Lockheed Missiles and Space Co., Sunnyvale, Calif.

**ANALYSIS OF DATA FROM SPACECRAFT (STRATOSPHERIC WARMINGS) Final Report, Sep. 1973 - Apr. 1974**

24 Apr. 1974 197 p refs

(Contract NASw-2553)

(NASA-CR-140050; LMSC/D420934)

Avail: NTIS

HC \$13.00 CSCL 04A

The details of the stratospheric warming processes as to time, area, and intensity were established, and the warmings with other terrestrial and solar phenomena occurring at satellite platform altitudes, or observable from satellite platforms, were correlated. Links were sought between the perturbed upper atmosphere (mesosphere and thermosphere) and the stratosphere that might explain stratospheric warmings. Author

**N74-32805\*#** Caspan Corp., Houston, Tex.

**SCREENING, CATALOGING AND INDEXING OF EARTH RESOURCE AIRCRAFT MISSIONS Final Report**

Sep. 1974 8 p

(Contract NAS9-13804)

(NASA-CR-140239) Avail: NTIS HC \$4.00 CSCL 05B

Data obtained from 30 earth resources aircraft missions, flown between September 1, 1973 and September 1, 1974, were screened, cataloged, and indexed using microfilm copy. The manhours required for completing the task are presented, and problems encountered during the project are reported. It is concluded that a cataloging and indexing report of remote sensor data can be prepared on a timely basis for a relatively low cost from microfilm. Recommendations are given in order to further facilitate the task. A.A.D.

**N74-32811#** European Space Research Organization, Paris (France).

**THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. 4: EARTH RESOURCES**

1973 430 p refs Proc. of the ESRO Summer School 1973 4 Vol.

Avail: NTIS HC \$24.50

The application of remote sensing for global observation from spacelab is discussed in great detail. Contributions are classified into introductory papers, sensors for spacelab, earth science applications, data processing aspects, and spacelab payload aspects. Remote sensing techniques involve photography, multispectral scanning, passive microwave techniques, and side-looking radar. Geology, geography, hydrology, oceanography, and fishery are dealt with as earth science applications.

**N74-32815\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**EARTH RESOURCES SURVEYS FROM SPACELAB**

O. Glen Smith /In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 15 p

The use of the space shuttle and of spacelab in earth resources surveys is reviewed. Advantages for viewing earth resources from space are summarized and research and development requirements are dealt with. Man's role in spacelab and shuttle operations is discussed and flight schedules are tabulated. ESRO

**N74-32821** Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

**SPACELAB APPLICATION IN GEOLOGY, GEOGRAPHY, HYDROLOGY**

J. Bodechtel /In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 15 p

The main tasks for spaceborne geological observation are outlined and examples of satellite photographs are given. The principal possibilities for spaceborne observations involving changing phenomena and their regional relationships in hydrology are indicated. ESRO

**N74-32829** Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

**[ USE OF SPACELAB FOR EARTH OBSERVATION. CONCLUSIONS]**

J. Bodechtel /In ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 6 p

The role of spacelab in global monitoring with remote sensors is reviewed. ESRO

**N74-33873\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

**THIRD EARTH RESOURCES TECHNOLOGY SATELLITE SYMPOSIUM. VOLUME 3: DISCIPLINE SUMMARY REPORTS**

Stanley C. Freden, comp., Enrico P. Mercanti, comp., and David B. Friedman, comp. Washington May 1974 159 p refs

Presented at the 3rd Symp. on Significant Results Obtained from the 1st Earth Resources Technol. Satellite, Washington, D. C., 10-14 Dec. 1973; Sponsored by NASA

(NASA-SP-357) Avail: NTIS MF \$2.25; SOD HC \$2.30 CSCL 05B

Presentations at the conference covered the following disciplines: (1) agriculture, forestry, and range resources; (2) land use and mapping; (3) mineral resources, geological structure, and landform surveys; (4) water resources; (5) marine resources; (6) environment surveys; and (7) interpretation techniques.

**N74-33887#** Atomic Energy Commission, Washington, D.C.

**ENVIRONMENT Subpanel Report 14 used in Preparing the AEC Chairmans Report to the President**

S. M. Greenfield 27 Oct. 1973 402 p

(WASH-1281-14) Avail: NTIS HC \$23.25

Two basic conclusions are drawn with respect to the challenge of preventing environmental degradation: first, development and implementation of energy systems for achieving and maintaining energy self-sufficiency clearly must be sensitive to the effects that the systems will have on health, welfare, and ecosystems. Second, if this sensitivity is rationally incorporated into the development and implementation of energy processes, these domestic resources can be broadly utilized in harmony with the environment. The achievement of this second point is the fundamental goal to which this environmental research agenda is directed. This agenda consists of four environmental science subprograms constructed by projecting presently known and anticipated concerns for the impacts of existing and developmental

energy systems on the environment. These subprograms are: (1) pollutant characterization, measurement, and monitoring; (2) transport processes; (3) effects (health, ecological welfare, and social); and (4) environmental assessment and policy formulation. A total FY 1975-1979 funding level of \$863.7 million is broken down for each year for each subprogram. NSA

**N74-33925#** National Committee for Geochemistry, Washington, D.C.

# **ORIENTATIONS IN GEOCHEMISTRY**

Jan. 1974 139 p refs

(Contract NSF C-310)

(PB-232690/8; ISBN-0-309-02147-2) Avail.: NTIS MF \$1.45; National Academy of Sciences, Printing and Publishing Office, 2101 Constitution Ave., Washington, D.C. HC \$5.75 CSCL 08D

An effort is made to provide a useful description of the growing field of geochemistry, its scope and potential. The report presents an assessment of current work in geochemistry, analyzes its interrelationships with the other earth and planetary sciences, and suggests directions for progress in the field during the next 5 to 10 years. Discussions center around the four major subject areas of extraterrestrial geochemistry, solid earth geochemistry, exogenic or low-temperature aqueous chemistry, and organic geochemistry. The report also discusses the interrelations of geochemistry and environmental concerns, and the role of geochemistry in understanding the origin of natural resources and contributing to their development. Brief section on experimental techniques and facilities and on data and sample accessibility complete the report. GRA

**N74-33926#** Earth Satellite Corp., Washington, D.C.  
**REPORT OF THE ERS SATELLITE COST BENEFIT STUDY.**  
Quarterly Report, Nov. 1973 - Jan. 1974

22 Feb. 1974 96 p refs

(Contract DI-14-08-0001-13519)

(PB-232649/4; USGS-DO-74-007; QR-4) Avail.: NTIS HC \$4.00 CSCL 08F

Studies in rangeland and water resources management were completed. Others on land use planning and environmental management continued. Recommendations were made for case studies in forestry management to evaluate benefits from timber inventory, assessment and control of destructive agents and fire damage, and estimation of forest vigor; and in environment monitoring to evaluate status of strip mining and reclamation, condition of wetlands, and regional water quality. Technical notes on definition of the environmental monitoring case study, and evaluation of case study potential in marine resource management are presented. GRA

**N74-34261\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

# **A COMPARISON OF ELECTRIC AND MAGNETIC FIELD DATA FROM THE OGO-6 SPACECRAFT**

R. A. Langel Aug. 1974 34 p refs Submitted for publication (NASA-TM-X-70752; X-922-74-253) Avail.: NTIS HC \$4.75 CSCL 03B

Electric and magnetic field disturbance characteristics from OGO-6 were studied. Examination of simultaneous patterns of disturbance below 600 km over the summer polar cap showed that pattern changes in electric field and in the disturbance in magnetic field magnitude are highly correlated. This correlation extends to pattern shapes boundary locations, and to the amplitudes of the correlated quantities. In the winter hemisphere, at altitudes above 800 km, correlations between boundaries exist, pattern correlations are present, and amplitude correlations are essentially absent. Below 600 km the region of positive delta B, from 2200 to 1000 MLT, has a significant contribution from ionospheric and nonionospheric sources. Above 800 km the nonionospheric sources dominate. Author

**N74-34419#** Committee on Science and Astronautics (U. S. House).

# **INTERNATIONAL SCIENCE AND TECHNOLOGY TRANSFER ACT OF 1974**

Washington GPO 1974 174 p refs Hearings before Subcomm. on Intern. Cooperation in Sci. and Space of the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., no. 37, 21-23 May 1974 (GPO-35-283). Avail.: Subcomm. on Intern. Cooperation in Sci. and Space

Technology transfer-legislation for international cooperation is considered with emphasis on telecommunication, solar energy conversion, and earth resources observation systems. G.G.

**N74-34774\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

# **GUIDEBOOK TO THE HAWAIIAN PLANETOLOGY CONFERENCE**

Ronald Greeley, ed. (Santa Clara Univ., Calif.) Aug. 1974 256 p refs Presented at the Mars Geol. Mappers Meeting, Hilo, Hawaii, 1974; Sponsored by NASA

(NASA-TM-X-62362) Avail.: NTIS HC \$6.50 CSCL 08F

**N74-34811** Joint Publications Research Service, Arlington, Va.  
**WORK OF THE SPECIALIZED SCIENTIFIC CONFERENCE SPACE SURVEYS FOR STUDYING THE EARTH AND PLANETS**

V. L. Zaychenko *In its* Geodesy and Aerial Phot., 1972 (JPRS-63013) 19 Sep. 1974 p 168-173 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Geod. Aerofotos. (Moscow), no. 6, 1972 p 129-132

Photometric analyses on photographs of the earth- and lunar-surfaces taken by satellites are elaborated for processing into cartographic maps. G.G.

**N74-35250\*#** Kansas Univ. Center for Research, Inc., Lawrence, Space Technology Center.

# **THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION INTERDISCIPLINARY STUDIES IN SPACE TECHNOLOGY AT THE UNIVERSITY OF KANSAS Final Report**

B. G. Barr Sep. 1974 163 p refs

(Grant NGL-17-002-001)

(NASA-CR-140623) Avail.: NTIS HC \$11.25 CSCL 22A

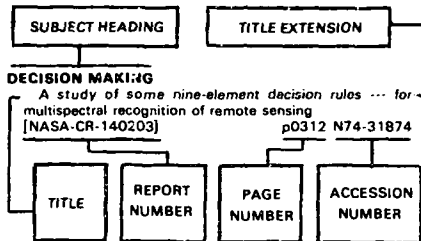
A broad range of research projects contained in a cooperative space technology program at the University of Kansas are reported as they relate to the following three areas of interdisciplinary interest: (1) remote sensing of earth resources; (2) stability and control of light and general aviation aircraft; and (3) the vibrational response characteristics of aeronautical and space vehicles. Details of specific research efforts are given under their appropriate departments, among which are aerospace engineering, chemical and petroleum engineering, environmental health, water resources, the remote sensing laboratory, and geoscience applications studies. A.A.D.

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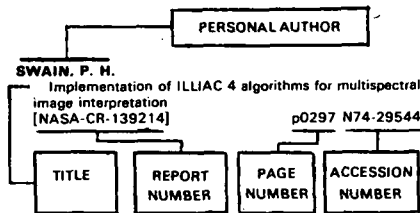
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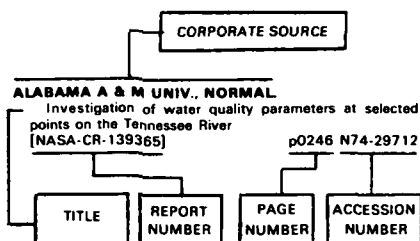
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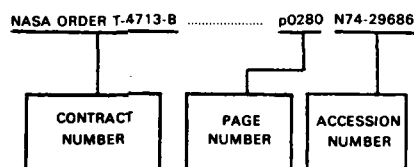
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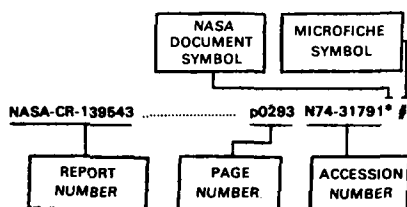
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